

The

Communicator

September - October 2025



The Bi-monthly Journal of Surrey Amateur Radio Communications



QSK?

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...from the Editor's Shack



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Issues appear bi-monthly, on odd-numbered months, for area Amateur Radio operators and beyond, to enhance the exchange of information and to promote amateur radio activity.

Contributions of articles and photos are welcome.

During non-publication months we encourage you to visit the Digital Communicator at ve7sar.blogspot.ca, which includes recent news, past issues of The Communicator, our history, photos, videos and other information.

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If you find The Communicator worthwhile, regular readers who are not SARC members are invited to contribute a [donation](#) towards our Field Day fund via [PayPal](#) or via eTransfer to payments@ve7sar.net

SARC maintains a website at www.ve7sar.net

Summer has passed and we're looking forward to a new year of SARC/SEPAR activities. First on our calendar is our 50th SARC anniversary on Tuesday, October 7th. Coincidentally, it was on Tuesday, October 7, 1975 that the first SARC meeting was held at a local high school. Tuesday is also our SARC Net night at 8pm Pacific time, and it would be fabulous if some of our remote readers could check-in using IRLP or EchoLink.

IRLP node 1736
Echolink node 496228

You will find some interesting projects and columns in this issue. The award winning PERformer end-fed half-wave vertical, developed by Greg Mihran KJ6ER, is an easy and very affordable project, even for a beginner and, having built two, we can attest that it works just as well as any of the commercially made products costing hundreds of dollars. I built mine for \$35. It will likely become a club build for our members in the near future. There are some follow-up articles from other users, all of them favourable, covering this same antenna and its variations.

Kevin McQuiggin VE7ZD/KN7Q has an informative overview of the radio and antenna systems in use on aircraft. Steve Stroh N8GNJ writes about a Linux handie talkie and the Zero Retries September digital conference which sounds like a winner for digital enthusiasts. Our other regular columnists have been busy writing on their areas of interest. In other words, there is something for everyone.

Enjoy this issue, and please keep the feedback coming.

73,

~ John VE7TI, Editor
communicator@ve7sar.net

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Do you have a photo or bit of Ham news to share? An Interesting story or link?

Something you are looking for?

eMail it to [communicator at ve7sar.net](mailto:communicator@ve7sar.net) for inclusion in this publication.



This Month's Cover...

Dino VE7NX has been experimenting in the microwave bands. Here he is at a recent outing communicating with enthusiasts on both Vancouver Island and in Washington State. Details of his exploits are on page 7.

*"In the end, it's not the years in your life that count, it's the life in your years."
- Ken Curtis.*



The Rest of the Story...

The Unsung Pioneers

A Lesser Known Pioneer in Radio Wave Propagation and Wireless Communication

Jonathan Zenneck
(1871-1959)

Jonathan Adolf Wilhelm Zenneck was born on April 15, 1871, in Ruppertshofen, Württemberg, in what is now Germany. From an early age, he demonstrated a strong aptitude for mathematics and physics, leading him to pursue higher education at the Technical University of Stuttgart and later at the University of Tübingen. In 1894, Zenneck took the state examination in mathematics and natural sciences and the examination for his doctor's degree. His dissertation, supervised by Theodor Eimer, was on grass snake embryos. In 1894, Zenneck conducted zoological research (Natural History Museum, London). Between 1894 and 1895, he served in the military.

In 1895, Zenneck left zoology and turned over to the new field of radio science. Under the guidance of prominent physicists, he developed a keen interest in the emerging field of wireless telegraphy, which was still in its infancy during the late 19th century. He became assistant to Ferdinand Braun and lecturer at "Physikalisches Institut" in Strasbourg, Alsace. Nikola Tesla's lectures introduced him to the wireless sciences. In 1899, Zenneck started propagation studies of wireless telegraphy, first over land, but then became more interested in the larger ranges that were reached over sea.

In 1900 he started ship-to-coast experiments in the North Sea near Cuxhaven, Germany. In 1902 he conducted tests of directional antennas. In 1905, Zenneck left Strasbourg since he was appointed assistant-professor at the Danzig Technische Hochschule and in 1906, he became professor of experimental physics in the Braunschweig Technische Hochschule. Also in 1906, Zenneck wrote "Electromagnetic Oscillations and Wireless Telegraphy", the then standard textbook on the subject. In 1909, he joined Badische Anilin und Sodafabrik in Ludwigshafen to experiment with electrical discharges in air to produce bound nitrogen as fertilizer. In 1913, he became director of the newly created Physics Institute of the Technische Hochschule München.



Zenneck analyzed solutions to Maxwell's equations describing electromagnetic waves that are localized around an interface between a conducting medium and a non-conducting medium. Zenneck's most significant contributions came in 1907 when he described what is now known as the Zenneck wave—a type of surface electromagnetic wave that propagates along the boundary between two media, such as air and ground or air and seawater.

Unlike space waves, which travel in straight lines, or skywaves, which reflect off the ionosphere, Zenneck waves follow the Earth's curvature, enabling long-distance communication without relying on reflection or refraction. The Zenneck wave propagates parallel to the interface and decays exponentially vertical to it, a property known as evanescence. It exists under the condition that the permittivity of one of the materials forming the interface is negative, while the other one is positive, as for example the interface between air and a lossy conducting medium such as the terrestrial transmission line.

[An animated diagram may be found at: https://upload.wikimedia.org/wikipedia/commons/thumb/a/a7/SPP_silver-air_interface_10um.gif/330px-SPP_silver-air_interface_10um.gif] and, pseudo-science or a breakthrough? Nupower, a company in Bahrain claimed in 2018 to have developed a process to harness Zenneck waves to generate electricity. [see <https://www.youtube.com/watch?v=vQTYaL9jCMo>], but I could find no current record of a company under that name.

This concept was particularly important for ground-wave radio transmission, which played a crucial role in maritime and military communications before the ionosphere's role in long-distance signaling was fully understood. Zenneck analyzed plane wave solutions having this property; he also analyzed solutions with cylindrical symmetry having this property.

Arising from original analysis by Arnold Sommerfeld and Jonathan Zenneck of the problem of wave propagation over a lossy earth, it exists as an exact solution to Maxwell's equations. Recently in 2020, it was demonstrated

by Oruganti et al., that it was possible to excite Zenneck wave type waves on flat metal-air interfaces and transmit power across metal obstacles

Ferdinand Braun, a future Nobel laureate was known for his contributions to wireless telegraphy. Together, they improved spark-gap transmitters and antenna systems, which were critical for early radio communication.

Beyond his theoretical work, Zenneck made substantial contributions to radio engineering. He helped develop directional antennas for more efficient signal transmission and investigated atmospheric effects on radio waves, shedding light on issues like fading and interference. In 1905, he authored one of the first comprehensive textbooks on wireless telegraphy, *Leitfaden der drahtlosen Telegraphie*, which became a standard reference for engineers. His leadership extended beyond academia; he served as a professor at the Technical University of Danzig and later as director of the Institute of Physics at the Technical University of Munich. Additionally, he co-founded the German Society for Wireless Telegraphy and played a key role in establishing the Deutsches Museum in Munich, where he curated exhibits on radio technology.

Around World War I, Zenneck served on the front-lines as a captain in the Marines. However, in 1914, the German government sent him and Karl Ferdinand Braun to the United States as technical advisor in a patent case involving Telefunken. The US Marconi Company sued Telefunken for patent infringement, a case spurred by the British government in an attempt to shut down transatlantic wireless telegraph between the US and Germany. The case stalled and eventually went moot when the United States entered the war, declaring Zenneck a Prisoner of War.

He was dismissed only in 1920 when he could finally take over the professorship of experimental physics at the Technische Hochschule München. In that time he resumed propagation studies, now with shortwaves and was first in Germany to study the ionosphere with vertical sounding at his station at Kochel/Bavaria. From the 1930s, Zenneck directed the



Deutsches Museum in Munich, and rebuilt it after World War II. Zenneck was awarded the 1928 IRE Medal of Honor for his achievements in basic research on radio technology and for fostering academic and technical offspring he received the Siemens-Ring in 1956.

Despite the disruptions of World War I and World War II, Zenneck remained an influential figure in German scientific circles. After retiring from active teaching in 1939, he continued to contribute to the field until his death on April 29, 1959, in Munich.

Although his name is less recognized than those of Hertz, Marconi, or Tesla, his work laid the foundation for modern telecommunications. His insights into surface-wave propagation influenced AM radio broadcasting, military communications, and even modern applications in radar and microwave engineering. While often overlooked in popular histories of radio, Jonathan Zenneck's contributions remain embedded in the principles that govern how radio waves travel across and along the Earth—a testament to his enduring impact on wireless technology.

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A look at Edwin Armstrong's contribution to broadcasting

Major Edwin Howard Armstrong was one of radio's legendary figures. Inventor of superheterodyne and FM, the Major fought for years to enforce the patents on his creations, a struggle which lasted until his death in 1954.

In June, the legacy of FM radio pioneer Edwin Armstrong was honored with a commemorative broadcast from the historic Alpine Tower in Alpine, New Jersey. Spearheaded by Steve Hemphill, this event marked the 20th anniversary of the Armstrong Memorial broadcast, originally launched in 2005 to celebrate Armstrong's groundbreaking contributions to radio technology. The station WA2XMN returned to the airwaves on June 19 at 12 p.m., transmitting on Armstrong's original low-band frequency of 42.8 MHz. This frequency, once used by Armstrong himself, has previously reached listeners up to 100 miles away and could be accessed via police scanners and software-defined radios.

The Alpine Tower, completed in 1937, was central to Armstrong's FM experiments and remains a symbol of radio innovation. The original brick transmitter building still bears the call sign etched above its entrance, preserving the site's historical significance. Hemphill will use a restored Phasitron transmitter, built with vintage components and operating at 250 watts, to broadcast programming from the 2005 event. This includes interviews with Armstrong's niece Jeanne Hammond, author Tom Lewis, and a production of "Empire of the Air: The Men Who Made Radio."



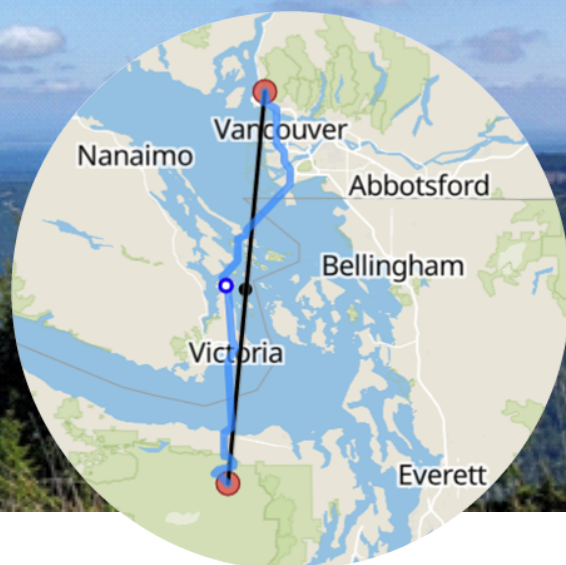
The Alpine site, nestled in Bergen County's Palisades and about 15 miles from the Empire State Building, also hosts Fairleigh Dickinson University's WFDU(FM) and served as an emergency broadcast location after 9/11. Hemphill, a veteran consulting engineer and founder of Solid Electronics Labs, has dedicated his career to preserving Armstrong's legacy. Hemphill collaborated with Kirk Harnack's "This Week in Radio Tech" podcast to expand coverage. The event not only commemorated Armstrong's achievements but also celebrated the enduring impact of FM radio on broadcasting and technology.

There is a commemorative video of Armstrong's 70th anniversary broadcast at <https://www.youtube.com/watch?v=kByE5sayn2c>.

~

Field Day and Cross-Border Microwave Activity

By JOHN BRODIE VA7XB



Reported earlier this year in both the Communicator and the RAC journal Canadian Amateur were SARC's microwave achievements including the first-ever 10 GHz and 24 GHz beacon installations in British Columbia, the trans-boundary distance communication records set between BC and US hams, and unique QSOs using the special event callsign, VB7MAN.

Collectively, these events provided an ideal springboard for a public demonstration of SARC's commitment to cutting-edge microwave technologies. What better opportunity than ARRL Field Day, the annual showcase of amateur radio to the world? So SARC members, Dino VE7NX and Scott VA7SC, set up on the roadside near SARC's Operations & Training Centre and completed 10 GHz and 24 GHz SSB contacts to earn bonus points for VE7SAR. Doug VA7JDJ was also successful in making his first contact on these frequencies.

Leading up to Field Day and in the spirit of promoting cross-border microwave activity, Dino and Scott along with Kirk VA7RKM in Victoria on Vancouver Island, Frank AG6QV and Ray W7GLF in Washington launched a new group, which they call Pacific Northwest Microwave Group (PNWMW). More recently, Alex VE7IRU in Nanaimo on Vancouver Island has been welcomed as a new member of the group.

These enthusiasts meet on the airwaves the first Sunday of every month, a day which they call "MAD" (Microwave Activity Day) to push back the frontiers. So far, the BC contingent located on Cypress Mountain in North Vancouver has successfully completed 10 GHz contacts with the US members Frank and Ray located in different grid squares near Seattle by bouncing signals off Mt. Rainier. The next challenge to be attempted in the Fall is 24 GHz via this path.

Then, in August while Dino was away in Bulgaria, the group expanded further with more participants joining the 10 GHz activity. On the Canadian side were Scott VA7SC, Alex VE7IRU (VE7KJ), Gabor VE7JH and Kirk VA7RKM. On the USA site were Frank AG6QV, Ray W7GLF, Bob W7PUA and Konrad WA4OSH. Due to the weather conditions only the USA stations made QSOs between them. It's great to see that the PNWMW group is active and growing.

~ John VA7XB

Cover image: Dino's 24 GHz portable set up with 12" dish running 1W.





NCDXF

The Northern California DX Foundation

Decrypting solar indices

The [Northern California DX Foundation](#) (NCDXF) is a charitable organization established in 1972 by a group of avid DXers in San Francisco. Its primary mission is to provide financial support for well-organized DXpeditions to desirable DXCC entities and to advance DXpeditioning skills, technology, and infrastructure.

NCDXF also collaborates with the International Amateur Radio Union (IARU) to operate a worldwide network of high-frequency beacons, known as the NCDXF/IARU International Beacon Project. These beacons help amateur radio operators understand propagation conditions by transmitting signals on multiple bands around the clock.

If you're interested in amateur radio or DXing, NCDXF plays a significant role in supporting and promoting these activities. Is there anything specific you'd like to know more about regarding NCDXF or amateur radio?

The Planetary K-index (Kp)

Kp is a scale used to measure the magnitude of geomagnetic disturbances in the Earth's magnetic field. It ranges from 0 to 9, with higher values indicating stronger geomagnetic storms. The Kp index is derived from the maximum fluctuations in the horizontal component of the Earth's

magnetic field observed over a three-hour interval at multiple geomagnetic observatories around the world.

Here's a quick breakdown of the Kp index values:

- Kp 0-2: Quiet
- Kp 3: Unsettled
- Kp 4: Active
- Kp 5: Minor storm (G1)
- Kp 6: Moderate storm (G2)
- Kp 7: Strong storm (G3)
- Kp 8: Severe storm (G4)
- Kp 9: Extreme storm (G5)

The Kp index is crucial for understanding space weather and its potential impacts on systems like power grids, satellite operations, and radio communications.

SFI

The Solar Flux Index (SFI) is a measure of solar activity and is used to determine the level of radiation being received from the Sun. It is measured in solar flux units (SFUs) and represents the amount of radio noise or flux emitted at a frequency of 2800 MHz (10.7 cm).

The SFI is an important indicator for understanding space weather and its impact on radio communications, especially for amateur radio operators. Higher SFI values generally indicate better conditions for high-frequency (HF) radio propagation, as increased solar activity enhances the ionization levels in the Earth's ionosphere, allowing radio signals to travel further and more reliably.

The Solar Flux Index (SFI)

The Solar Flux Index typically ranges from 50 to 300 solar flux units (SFUs). Lower values indicate less solar activity, which can result in poorer high-frequency (HF) radio propagation conditions. Conversely, higher values suggest increased solar activity, leading to better ionization in the Earth's ionosphere and improved HF radio communication.

The Ap Index

The Ap index is a measure of geomagnetic activity, providing a daily average level of disturbances in the Earth's magnetic field. It is derived from the Kp index, which measures geomagnetic activity over three-hour intervals. The Ap index is calculated by converting the Kp values into a linear scale called the a-index and then averaging these values over a day.

Higher Ap index values indicate stronger geomagnetic activity, which can affect satellite operations, power grids, and radio communications.

The GOES-16 X-ray index

The GOES-16 X-ray index refers to measurements of solar X-ray flux taken by the GOES-16 satellite. These measurements are used to monitor solar activity, including solar flares, which can impact the Earth's ionosphere and affect high-frequency (HF) radio communications.

The GOES-16 satellite measures X-ray flux in two wavelength bands:

- 0.5-4.0 Ångströms (Å)
- 1.0-8.0 Ångströms (Å)

These measurements help track solar flares and other solar phenomena that can lead to geomagnetic storms.



(L to R - All are SK): Ross Forbes (K6GFJ), Don Schliesser (K6RV), Jack Troster (W6ISQ), Vince Chinn (W6EE)

At a December 2011 luncheon held in Palo Alto (CA), Ross Forbes, K6GFJ, NCDXF Director, presented Jack Troster, W6ISQ, with his "Founders" Polo shirt on behalf of the Foundation Board of Directors. Two of the other original 4 Founders of NCDXF -- Donald Schliesser, K6RV, and Vincent Chinn, W6EE -- also attended the luncheon. The 4th Founder, Lee Shaklee, W6BH, was unable to attend.

The sunspot number index is a measure used to quantify the number of sunspots and sunspot groups present on the surface of the Sun. It is an important indicator of solar activity and is used to track the solar cycle, which typically spans about 11 years.

The sunspot number is calculated using the formula:

$$R=k(10g+s)$$

where:

- (R) is the sunspot number
- (g) is the number of sunspot groups
- (s) is the total number of individual sunspots
- (k) is a scaling factor that accounts for differences in observation conditions and equipment

Higher sunspot numbers indicate increased solar activity, which can affect space weather, radio communications, and satellite operations.

If you have any more questions about solar activity or related topics, feel [free to ask!](#)

~ NCDXF



The phenomenon known as the "Gray Line" is one of the most fascinating aspects of amateur radio propagation, offering unique opportunities for long-distance communication, particularly on the HF (High Frequency) bands.

The article "[Gray Line: The Twilight Zone of Radio Propagation](#)" from OnAllBands.com delves into this intriguing propagation mode, explaining its mechanics, significance, and practical applications for radio enthusiasts. This propagation profile summarizes and expands upon the key points of the article, providing a deeper understanding of the Gray Line and its role in radio communication.

What is the Gray Line?

The Gray Line, also referred to as the terminator, is the transitional zone between day and night on Earth, where twilight occurs. It is the dividing line between the illuminated and shadowed portions of the planet, moving continuously as the Earth rotates. In the context of radio propagation, the Gray Line is significant because it creates unique ionospheric conditions that enhance long-distance communication, particularly on the lower HF bands such as 160 meters, 80 meters, and 40 meters. An example is shown in the graphic above. Near sunset in Vancouver on June 1st, 2025, the gray line provided an opportune path to New Zealand, through western Europe and Africa.

The ionosphere, a layer of the Earth's atmosphere extending from approximately 50 to 600 miles above the surface, is critical to HF radio propagation. It contains ionized particles that refract radio waves, allowing them to travel beyond the line-of-sight.

During twilight, the ionosphere undergoes rapid changes due to the transition between solar illumination and darkness, creating a "sweet spot" for radio signals to propagate over great distances with minimal loss.

How the Gray Line Works

The OnAllBands article explains that the Gray Line enhances propagation due to the ionosphere's behavior during twilight. During the day, the ionosphere's D-layer, which absorbs lower-frequency radio signals, is strongly ionized by solar radiation. At night, the D-layer dissipates, allowing signals to reach the higher F-layer, which reflects them back to Earth over long distances. Along the Gray Line, the ionosphere is in a transitional state: the D-layer is weakening, but the F-layer remains sufficiently ionized to support long-distance propagation.

This combination creates a low-loss propagation path, particularly for signals traveling along the Gray Line corridor—where one station is in daylight and the other is in darkness, or both are near the terminator. The article highlights that this effect is most pronounced on lower HF bands because these frequencies are less affected by solar activity and ionospheric absorption compared to higher bands.

Practical Applications for Amateur Radio Operators

For amateur radio operators, understanding and leveraging the Gray Line can significantly enhance DX (long-distance) communication.

The author offers some practical tips for utilizing this phenomenon:

- **Timing is Critical:** Gray Line propagation is time-sensitive, occurring during sunrise and sunset at either the transmitting or receiving station. Operators must align their communication schedules with the Gray Line's position, which can be tracked using software tools like propagation prediction programs or Gray Line maps.
- **Band Selection:** The lower HF bands (160m, 80m, and 40m) are most effective for Gray Line propagation due to reduced D-layer absorption during twilight. Operators targeting DX contacts should prioritize these bands during Gray Line windows.
- **Geographic Awareness:** The Gray Line follows a predictable path based on the Earth's rotation and tilt. Operators can use tools like VOACAP or online Gray Line maps to identify when the terminator aligns with desired communication paths, such as between North America and Asia or Europe and Australia.
- **Antenna Optimization:** Directional antennas, such as Yagis or dipoles oriented toward the Gray Line path, can maximize signal strength. The article emphasizes that low-angle radiation patterns are particularly effective for Gray Line DXing.

Scientific and Technical Insights

From a technical perspective, Gray Line propagation is a result of complex ionospheric dynamics. The article notes that the F-layer, which splits into F1 and F2 layers during the day, merges into a single layer at night. Along the Gray Line, the F-layer is still active but less turbulent, providing a stable medium for signal refraction. The D-layer's reduced absorption during twilight further enhances signal efficiency.

The phenomenon is also influenced by seasonal and solar cycle variations. During equinoxes (March and September), the Gray Line aligns more closely with the Earth's meridians, creating favorable conditions for north-south communication paths. Conversely, during solstices, the Gray Line's tilt favors east-west paths. Solar activity, measured by the solar flux index or sunspot number, can also affect Gray Line propagation, with moderate solar activity often providing optimal conditions.

Challenges and Considerations

While the Gray Line offers unique opportunities, it also presents challenges. The window for Gray Line

propagation is narrow, typically lasting 30-60 minutes during sunrise or sunset. Operators must be precise in their timing and prepared for rapidly changing conditions. Additionally, the Gray Line's effectiveness can vary depending on geomagnetic activity, with disturbances like solar flares or coronal mass ejections potentially disrupting ionospheric stability.

The OnAllBands article also cautions that Gray Line propagation is not a guaranteed phenomenon. Operators may need to experiment with different bands, times, and antenna configurations to achieve success. Patience and persistence are key, as the Gray Line can sometimes yield unexpected contacts with distant stations that would otherwise be unreachable.

Tools and Resources

To assist operators in exploiting Gray Line propagation, the article recommends several tools:

- **Gray Line Maps:** Software like [DX Atlas](#) or websites like [VOACAP](#) provide real-time visualizations of the Gray Line's position.
- **Propagation Prediction Software:** Programs such as [W6ELProp](#) or [HamCAP](#) can forecast optimal times and bands for Gray Line DXing.
- **Amateur Radio Communities:** Online forums and clubs, such as those hosted by the ARRL (American Radio Relay League), offer valuable insights and real-time reports from operators worldwide.

The Gray Line is a captivating aspect of radio propagation that blends science, timing, and skill. The OnAllBands article effectively captures its allure, describing it as the "Twilight Zone" of radio communication—a fleeting but powerful window for connecting with distant stations. By understanding the ionospheric dynamics behind the Gray Line and employing strategic planning, amateur radio operators can unlock its potential for remarkable DX contacts. Whether you're a seasoned DXer or a newcomer to HF radio, the Gray Line offers a unique opportunity to explore the boundaries of radio propagation and connect with the global amateur radio community. For more details, visit the original article on [OnAllBands.com](#).

~ On All Bands, July 2025
([Mark Haverstock, K8MSH](#))

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News You Can't Lose

Rescue team locates and rescues a mother and child

On July 12, 2025, the Calaveras County Volunteer Team conducted its monthly training session near Spicer's Reservoir. At approximately 1:20 PM, the Dispatch Center received a report regarding two individuals traveling to the area who were overdue and not answering their cellular phones. The reporting person stated that a 49-year-old mother and her nine-year-old son, left the Sacramento area headed to Camp Wolfeforo. They also provided a location obtained from a location-sharing application they previously used with the missing person.

The Search and Rescue Team responded and established a command post. The team began assessing the terrain and the complex network of interconnecting, labyrinth-like roads to establish effective search parameters. Campers in the area between Black Springs and Winton Road, reported observing a vehicle matching the description of the missing persons around 4:00 PM on July 11.

At approximately 5:40 PM, a Search and Rescue team located a handwritten note posted at an intersection of a remote Forest Service Road. The note indicated that the author and her son were stranded and in need of assistance. The team followed the road and found another note, which provided additional information, including a telephone number and the names of the missing individuals. About a mile later, the searchers located the missing persons and their vehicle.



Due to the isolated location, which included dense forest and canopy, the search and rescue members were unable to communicate their discovery to the command post via conventional radio frequencies or cell phone. They utilized an amateur radio frequency to establish communication. Their call was immediately answered by a retired El Dorado County Communications Supervisor who was a ham operator monitoring frequencies from his home. This operator then contacted the El Dorado 911 center, which provided the information to Calaveras Dispatch, and the SAR command post was notified.

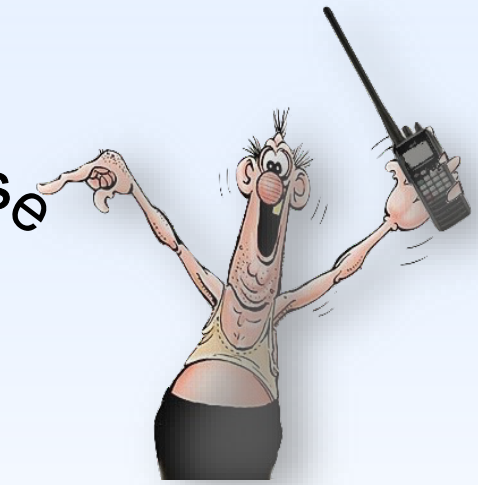
The Search Team was able to use vehicle recovery equipment to free the vehicle and assisted them back to the command post and to their awaiting family members.

Once back at the command post, the search managers and team members were able to piece together the circumstances that led to the missing persons becoming lost. In summary, the driver was using a GPS unit that supplemented common routes with additional remote roads. When the GPS signal was lost, the missing persons had already traveled deep into the remote area and were unable to retrace their route.

~

Page13—News You Can Lose

The Lighter Side of Amateur Radio



Georgia Couple Perplexed by Mystery in Back Yard

A Georgia couple found themselves in an unusual situation after moving into their new home in a small town north of Atlanta. While the house itself was in good condition, they were concerned and puzzled by a series of pipes protruding from their backyard. Unsure of their purpose, the husband—who chose to remain anonymous—took to Reddit under the username u/Thiggy-Stardust to seek help identifying the mysterious fixtures.

The couple had noticed the pipes even before purchasing the property. "We saw it when we first viewed the house," the husband told Newsweek magazine. "It's a sparse backyard and pretty hard to miss." In his [Reddit](#) post titled "Found in backyard of house just bought," he shared photos of the pipes, explaining that they weren't connected to the septic system, which had been recently repaired on the opposite side of the yard. "Doesn't appear to have any function—want to remove it, but afraid to until I know what it is," he wrote. *(Hmmm, you'd think the antenna tower in the background would have been a hint!)*

The post quickly went viral, gaining over 15,000 upvotes and sparking a flood of responses. Some users offered humorous guesses, suggesting the pipes could be a "ventilation pipe for a hidden bunker" or even a secret underground entrance.



Others were more critical, with one commenter joking, "I hear if you stand on top and press down, you'll go through into the underground!" A realtor chimed in, expressing disbelief that the couple hadn't investigated the pipes before buying the property.

Amid the jokes and critiques, a plausible explanation emerged: the pipes were likely mounting supports for a ham radio antenna. The homeowner confirmed this theory, noting that the remnants were just structural, with no functional equipment remaining. The discovery held sentimental value for him, as it

brought back memories of his grandfather, who had been an avid ham radio operator. "I would hang out with him in his ham shack when we visited as kids," he shared.

Now, the couple faces the task of removing the pipes—if possible. "If it proves too hard to remove, I think the next option would be to dig down 6 to 8 inches and cut them off, then cover with dirt and grass so I can mow that area safely," he said.

For now, the mystery has been solved, but a little more digging—literally—will determine just how easily they can reclaim their backyard.

~ The Newsweek story is at: [Couple Buy New House, Make Shock Discovery in the Backyard - Newsweek](#)

Radio Ramblings

Aircraft Radio Systems

by KEVIN McQUIGGIN VE7ZD / KN7Q

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Most people these days have taken a flight in a commercial airliner. While air travel used to be viewed as a luxury, with costs out of reach for the average person, competition has driven prices down to the point where air travel for business or pleasure has become commonplace.

You may have wondered about the role that radio systems play in modern commercial air travel. While voice communication between the aircraft and ATC (air traffic control) is a basic requirement, there is much more going on than might be apparent to the casual observer.

Non-voice communication in fact represents the majority of radio systems that are present on commercial aircraft.

This issue, I thought that it would be interesting to describe how flight crews utilize the aircraft's communications systems, and how these systems are integral, or even critical, to every commercial flight. We'll also look at frequencies of operation and antennas, and how all these radios and antennas can successfully operate within the airframe without interference to each other.

A Bit of Relevant Background

I haven't mentioned it before in this column, but I am a commercial pilot with ratings for the Boeing 727 and the McDonnell-Douglas DC10. I flew for a well-known cargo airline for a couple of years. See Figure 1.



The 727 was a short haul aircraft popular with the airlines from the late 1960s through about 2000. It was like the '737 of today; a medium capacity "people hauler" that could be flown efficiently on short and medium-haul routes. Its post-passenger role was that of a cargo aircraft, and 727s were employed by many large cargo carriers on domestic routes throughout North America up until about five to seven years ago.

The DC10 was a "heavy" (i.e. an aircraft with a takeoff weight greater than 300,000 lbs) and played a big role on the international stage. With a passenger capacity of about 300 people, the DC10 flew internationally on long-haul routes and was a favourite of flight and cabin crews until about twenty years ago, when it left passenger service.

The post-passenger role of the DC10 was as a cargo aircraft. It's just a bit smaller than the legendary Boeing 747, so it could carry a significant amount of mail and cargo. It was operated as a heavy cargo hauler by many well known national and international courier services until about 2020. Today, only a handful of DC10s remain in service as cargo aircraft in Asia and Africa.

Like the DC10, the 747 is reaching the end of its life as a passenger carrier, so many cargo carriers are retrofitting 747s and using to them carry cargo on international routes.

As older aircraft, the low fuel efficiency of both the 727 and the DC10 made it difficult for passenger airlines to make a profit. Cargo operations are more specialized, so the use of older aircraft still works for a positive bottom

line. The 727 also faced technological challenges that affected its operations, in that modern ATC requirements prevented the aircraft from being able to operate legally in certain classifications of airspace.

As a former flight crew member on both aircraft, I can draw on my experience with aircraft radio systems to describe them from both an operational and a technical perspective.

Basic Systems

Basic radio systems on any commercial aircraft include:

- Suitable voice communications equipment at both VHF/UHF, and possibly HF;
- A transponder that uniquely identifies the aircraft to ATC;
- VHF/UHF navigational units that allow the aircraft to fly an assigned flight path;
- Most likely, an ILS (instrument landing system) and DME (distance measuring equipment); and
- An emergency locator transmitter (ELT) - a legal requirement, as well a safety "no brainer".

Figure 2 shows the location of some of these systems on a light aircraft. We will look at commercial airliners shortly.

Figure 1 - VE7ZD and DC10

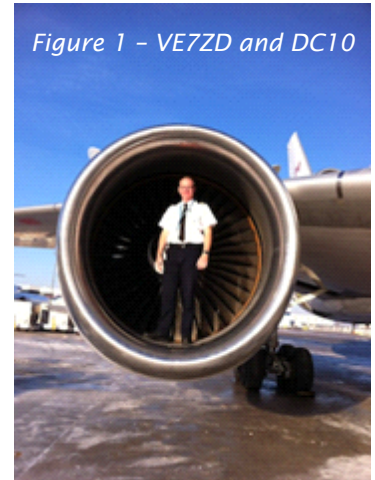


Table 1- Basic Aircraft Radio Systems denotes the frequency range of each type of system and summarizes its purpose and operation.

System	Description	Band	Frequency
Voice Communication	Verbal interaction with ATC; occasional use for control of aircraft lighting (ARCAL)	VHF, HF	118 - 137 MHz HF allocations in the range of 3000 – 18000 KHz Canada: 5680 KHz
Transponder	Identify aircraft; transmit altitude and other data	VHF	RX on 1030 MHz TX on 1090 MHz
Navigational Equipment (NAVAIDS)	Support navigation en route and on departure/approach to an airport	LF, VHF, UHF	NDB: 200 - 415 KHz VOR: 108 - 118 MHz DME: 960 – 1215 MHz SATNAV: 1575 MHz
ILS	Enhance landing capabilities;	VHF	118 – 137 MHz
ELT	Emergency aircraft location; activated automatically on a hard landing	VHF, UHF	121.5 MHz 406 MHz

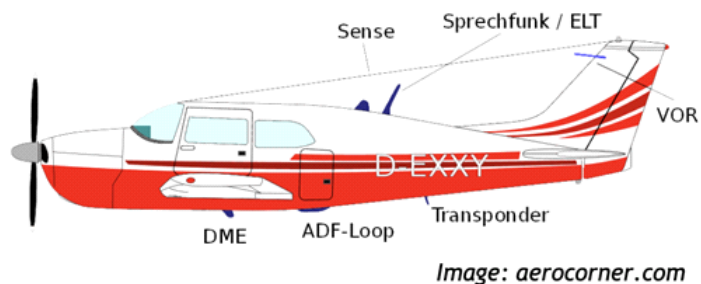


Image: aerocorner.com

Figure 2 - Antennas on a Light Aircraft

Voice Communications

Successful aviation is predicated on safe and clear communications between ATC and flight crews. The protocols and standard phraseology are beyond the scope of this article, but functional and adaptable VHF and HF radios are key to this process. Flight deck radios look quite similar to our VHF/UHF mobile radios in that they have buttons and knobs, easy setting of frequencies, memories, and other functionality that allow them to be used efficiently by the pilots. Aviation headsets connect to the aircraft's voice radio bus, but many flight crew members prefer to use hand mics, just as we amateurs do.

Redundancy is critical for safety, and commercial aircraft will have one radio for each flight crew member, with (likely) an additional radio available as backup. Many pilots also carry a handheld VHF airband radio for use in the almost unimaginable event of a full electrical system failure. I carried an Icom IC-A24 handheld in my flight bag, but fortunately never had to use it.

Cellular Telephones

It's a bit of an aside from our topic of aircraft radio systems, but these days every pilot has a cell phone, and it is common for much of the ground-based flight preparation work and logistics to be carried out by the flight crew through his or her cell, with calls to the airline office, ground logistics, fuelers and other services.

Regulations and technical understanding of the risks of using cellphones and tablets en route

(i.e. in flight) have evolved considerably over the past couple of decades. Many major airlines prohibit flight crew use of cell phones in flight, but other airlines have conducted safety evaluations and risk assessments and permit cellular phone use. Organizations that I flew for did not have significant restrictions, and I found that it was very efficient to be able to phone our dispatchers and other logistical services when approaching the destination. It improved situational awareness as well because it did not interfere with monitoring and communication with ATC.

Aircraft flying trans-oceanic routes are also required to have a functional satellite telephone (or satellite-based communications system) on board.

Aviation Radio Networks

Local and regional voice communications with ATC is on VHF, and takes place on channels assigned in the frequency range between 118 and 137 MHz. Aviation regulations and official publications (updated every 56 days) document all frequencies and channel classifications for each airport, and for regional ATC centres so that no matter where the aircraft is pilots can find the correct frequency for any service they may wish to reach.

The aviation radio network is an amazing system, with hundreds of stations and services available across Canada, North America, and the globe. In a light aircraft (e.g. a Cessna 172) or a commercial airliner, there is practically no place in Canada where it is "impossible" to reach ATC, weather services, flight planning or other aviation services to provide a pilot report (PIREP), update your flight plan, request detailed weather information, or seek other advice.

In some remote areas of Canada, while ATC may not be reachable directly by the aircraft, ground-based repeaters are available that provide essentially a "phone patch". The pilot activates a "DRCO" (dial-up remote communications outlet) facility on a published frequency by keying his or her mic, and carrier detection on the DRCO automatically calls ATC on a pre-arranged telephone number. ATC



answers, and the phone patch allows the pilot to communicate with ATC.

At non-tower airports (smaller airports with a control tower, or where the control tower closes overnight), pilots approaching for landing at night can similarly use a carrier detection system called ARCAL (Aircraft Radio Control of Aerodrome Lighting) to turn on runway lights at the aerodrome and set them to low, medium, or high intensity so that the aircraft can land. This is a non-voice service, but I include it here because ARCAL is usually supported on published aerodrome voice frequencies. Landing at night without runway lights is possible (and covered in pilot training for a “night rating”) but it is challenging, and most pilots would prefer not to do it.

Modulation

As we know from our amateur radio activities, the choppy nature of weak FM signals often causes them to be unreadable. Amplitude modulation (AM) modulation is more readable in marginal propagation situations. Aviation is predicated on safety, and so FM was rejected for use with ATC early in commercial aviation’s history.

In aviation, voice communication uses amplitude modulation at VHF and UHF, and LSB (lower sideband) on HF frequencies. As noted above, FM is not used because it requires a stronger signal strength level for demodulation. FM also requires greater bandwidth, and this would not work in the HF portion of the spectrum.

AM can be “decoded” audibly by human operators through significant noise and static and has proven to be more effective for communicating with pilots in all operating conditions.

Frequency Assignments

All frequencies used by aircraft are assigned by ATC, who direct aircraft to specific frequencies and perform “handoffs” from one controller or service to another. Pilots need to follow these directions and adjust radio frequencies as directed.

It is critical for flight crews that they record each frequency assignment and handoff by ATC, so that you can move back to the previous frequency in case communication is not established after the handoff.

Everyone usually has a story about this from early in their flying career as a private pilot. I will admit that I too had this experience: I was a new pilot and was flying a Cessna on a local sightseeing flight. I mis-heard ATC’s handoff frequency, could not establish contact with the next controller - because I had the wrong frequency. I had forgotten the previous frequency, so I could not QSY back to that frequency to ask for a repeat. Like every other junior pilot, with some embarrassment I had to go back to the main tower frequency and admit my error to the controller.

This experience usually fixes the issue, and every smart pilot starts writing down each ATC handoff frequency on his or her “kneeboard” (the little clipboard that you keep at hand during every flight). I passed this recommendation to all my students when I was a flight instructor, but some of them still got bitten by it.

HF Usage

The use of LSB rather than USB for HF aviation is simply a standard that was agreed upon internationally many decades ago. LSB is the standard so everyone uses it. I noted that on the DC10 the HF radio had a knob for selecting LSB/USB, but I don’t think that knob had ever been used.

Standard frequencies exist for HF communication, but these are not commonly used in continental North America because of the pervasive coverage of the VHF/UHF communications network.

In northern Canada, however, VHF coverage is spotty and there are many areas where ATC operates on HF. The key frequency is 5680 KHz (5.68 MHz) LSB. Other frequencies are used, but ATC is always listening on 5680 and will direct you to another frequency after you call them there if the request is significant.



Aeronautical Mobile

When I flew cargo on the DC10, the airline's fleet of DC10s had all previously been in service by major airlines on international passenger routes. HF radios were the norm, although we never used them on our domestic routes because the VHF radio network coverage was so good.

I will admit, though, that "VE7ZD aeronautical mobile" did show up on 20 metres a couple of times while we were in the middle of the 5 hour en route phase of our flight. The HF radio supported USB as well as LSB, so I just switched it over for a short period of amateur radio use.

Transponders

Conceptually, a transponder is a simple device, but the details of the technology could easily consume an entire article. I'll stick to the higher level aspects of the technology for today. See Figure 3 for a photo of a modern transponder from GARMIN.



Figure 3 - Transponder

Purpose

The purpose of the transponder is to assist ATC by assigning a unique 4-digit identifier to each aircraft and allow that code to uniquely identify each aircraft on ATC radar. Additional transponder capabilities can let ATC know an aircraft's position, altitude and other key information.

Transponders are also foundational to a system called TCAS (Traffic Collision Avoidance System) that allows commercial aircraft to share their position and altitude with other aircraft in flight. Should two aircraft lose separation then pilots in both aircraft will be notified and be able to take evasive action.

Use of transponders improves aviation safety. Transponders are required on transport category aircraft - those larger aircraft flown by airlines in commercial service but are optional on light aircraft operating outside of controlled airspace.

Methodology

ATC will provide the flight crew with this unique transponder code during the pre-taxi phase of flight. Standard terminology ("Squawk 2345") from ATC assigns this code before the aircraft is cleared to taxi, and the flight crew enters the code into the aircraft's transponder. This will identify the aircraft to controllers in the sphere of flight operations. When aircraft leave one sphere of operation (for example, North America) and are handed off to another region (for example, Europe), a new transponder code may be assigned by ATC.

There is no apparent consistency in the assignment of transponder codes, and the numbers appear random. It a question of curiosity among pilots as to how these codes are generated!

Technology

For the technically minded, the four digit transponder code is an octal number: a number expressed in Base-8, rather than the Base-10 numbers we use every day. This seems strange. Why octal?

It's for historical reasons: a four-digit transponder code represents a 12-bit binary number. The mini-computers (refrigerator-sized machines, actually, but that was very small for the late 1970s) that handled the early national transponder system and the radar system interfaces used octal numbers in their data entry and programming. Octal transponder codes persisted as the system evolved, and remain the standard to this day.

Transponders operate on internationally allocated RX and TX frequencies of 1030 and 1090 MHz, respectively. Here's a summary of how they work.

ATC radar systems TX an "interrogation" signal to all aircraft on 1030 MHz. When each aircraft receives this interrogation, the transponder replies by broadcasting its current transponder code (e.g. "2345") on 1090 MHz. ATC radar receives this information, couples it with the location of each aircraft as determined by the radar, and tags the radar target on ATC's screen with the transponder code.



The ATC systems also cross-reference the received transponder code with their database of flights, aircraft types, and flight numbers to further tag the radar target with this information. Thus the interrogation/response cycle allows ATC radar to not only show the radar return (location and speed of the aircraft) on ATC's displays, but also to label it (for example) "AC310/A320" (Air Canada flight 310; Airbus 320). This positively identifies the aircraft and type, which helps air traffic controllers manage their workload. Knowing the aircraft type gives controllers information about its limitations and capabilities.

But wait, there's more!

When the aircraft's transponder receives the interrogation signal, in addition to providing its current transponder code, it also provides the aircraft's current altitude. This is determined from other systems onboard the aircraft. The transponder's reply on 1090 MHz includes an encoded flight altitude.

This information is also of critical value to ATC, because one of their responsibilities is to ensure "separation" of aircraft - keeping safe horizontal and vertical distance between all flights under their control. When ATC radar receives each transponder's reply, it decodes the flight altitude and displays it with the other flight information "AC310/A320 FL370" (same as above, but adds FL (flight level) 370, - about 37,000 feet).

Minor point, but "flight level" numbers only roughly indicate the *actual* altitude of each aircraft above ground. The actual altitude could be up to around a few hundred to a thousand or so feet off of the FL value sent by the transponder to ATC. This is because of an international regulation that requires every aircraft to use a "standard altimeter setting" of 29.92 inHg (inches of mercury) above 18,000 feet. There is a metric equivalent, 1013.2 hectopascals (hpa), but strangely this 1013.2 hpa altimeter setting still needs to be applied when the aircraft passes 18,000 feet above ground level (AGL). For historical reasons, flight levels are standardized to be based on feet, not meters. Most aircraft and airlines still use *inHg* rather than *hpa* for altimeter settings, and for standard pressure setting above 18,000 feet.

Doesn't the use of standard pressure settings present a safety risk? No: this practice is safe (actually, safer) because above 18,000 feet *all flights are using the same altimeter setting*. While every aircraft's actual distance AGL will contain an error, *everyone is using the same standard, and that will ensure aircraft separation*.

Transponder Protocols

Newer transponder standards give aircraft the ability to encode additional information into their interrogation replies, including location and altitude. This is a product of modernization of systems and electronics. This additional information provides more data as to the status of the flight. ATC appreciates all the information it can get, and is also used by the onboard TCAS system (see below). More info generates better situational awareness, and this enhances safety even more.

Traffic Collision Avoidance System (TCAS)

An aircraft's TCAS system listens to transponder broadcasts on 1090 MHz from other aircraft within (typically) 200 NM and builds an internal 3D map of each aircraft's position, altitude and velocity.

Should either another aircraft come too close, or the track of another aircraft may present a risk in the near future, then the TCAS system will alert the pilots and advise them to take evasive action.

ATC listens to transponders from all aircraft and will also be able to identify a potential conflict, but TCAS operates locally and so may be able to warn the pilots of a conflict seconds before ATC can.

Seconds can make a difference at potential aircraft closing speeds of ~1000 NM per hour.

Navigational Aids (NAVAIDS)

This is a very complex subject. The purpose of NAVAIDS is to free aircraft (both private and commercial) from reliance on looking outside of the cockpit window for navigation. This allows flight under adverse weather conditions, flying in the clouds, and flight at higher altitudes. It simplifies navigation as flights can be routed "direct" rather than relying on spotting



landmarks and other visual indicators on the ground.

Flight using NAVAIDS alone (several types will be described briefly below) is called “IFR flight”, that is, flight conducted under Instrument Flying Rules. Flying and navigating by looking out the aircraft window is called “VFR” flight (Visual Flying Rules). VFR flights must be conducted with reference to landmarks on the ground, while IFR flight can proceed using radio navigation aids only, as will be described below. In IFR flight, looking out the window is optional. Pilots fly solely by reference to cockpit instruments.

IFR Advantages

Every commercial flight operated by a major airline is conducted under IFR.

IFR flight is more complex than VFR flight, and requires a specific rating (qualification) from flight regulators. All commercial airliners operate under IFR, and an IFR rating is a prerequisite for hiring at all airlines across the world.

IFR flight is actually easier in some respects than VFR flight. If aircraft capabilities are suitable, then the flight crew has little concern about average/typical weather, and not being able to see out of the cockpit window is of no concern. With the help of ATC and a flight plan, you will be able to get to where you’re going efficiently and with no major issues.

Private pilots can obtain an IFR rating, but to fly IFR, the aircraft must also be certified for IFR. You cannot fly a non-IFR certified aircraft in IFR, even if you possess an IFR rating.

Let’s look at some specific NAVAIDS and learn what they do. We’ll look at VORs, NDBs, and GNSS systems.

Non-Directional Beacons (NDBs)

NDBs were one of the earliest forms of NAVAID and date (in their earliest form) back to the 1930s.

An NDB ground station transmits a continuous tone in the LF portion of the radio spectrum on an assigned channel between 200 and 415 KHz. Mode is AM. The NDB also periodically transmits a unique identifier in CW at 5 word per minute.

This ID allows pilots to identify the NDB (and make sure that they have tuned in the correct station) before they start navigating to or from it.

For example, the Vancouver NDB transmits on 266 KHz and has the callsign “VR”.

Commercial pilots must have a rudimentary knowledge of CW in order to be able to decode NDB (and VOR, see below) identifiers.

In the past, commercial pilot candidates were required to pass a CW receiving test at 5 WPM, but that requirement was subsumed into performance-based testing a few decades ago. The reasoning: candidates for an IFR rating must demonstrate skills in relation to NAVAIDS; if the candidate cannot decode NAVAID identifiers, then they will clearly not be able to pass the IFR flight test.

The CW identifiers on NDBs (and VORs, again, see below) also indicate that the NAVAID is operating normally. A failed NAVAID, or one under maintenance, does not transmit its CW ID. Pilots must check each NAVAID before use by confirming its CW identifier.

NDB Navigation

There are approximately 881 NDBs across North America, and many more throughout the world. Many nations such as the USA are phasing out NDBs in favour of GNSS (satellite-based) navigational aids, but Canada and other nations are continuing NDB service and even expanding coverage. Should satellite-based systems (GNSS) fail, then NDBs will provide a functional alternative.

An NDB receiver in the cockpit, called the ADF (Automatic Direction Finder) contains a needle that always points the way to the selected NDB station. If the NDB is straight ahead, the needle points to the top (0 degrees). If the NDB is directly east, the needle points 90 degrees to the right. Pilots can turn the aircraft until the NDB is “straight ahead”, and fly towards it.

Once you fly over the NDB, the needle swings 180 degrees to indicate that the NDB is now behind you. Once the NDB is behind you, you can also fly away from it at any chosen heading.



NDBs are “low tech”. They allow an aircraft to navigate to or from the NDB, and to track inbound or outward to the NDB ground station on a particular magnetic track. Thus, they are similar to VORs, but without radials. However, wind is a significant issue: its presence tends to push the aircraft left or right of the desired track, and the pilot needs to compensate, usually manually, to keep the aircraft inbound or outbound on the chosen track.

Compensating for wind drift is not that difficult, but it requires much practise to learn the technique, and many private pilots struggle with it. Every private pilot in Canada must demonstrate basic knowledge of instrument flying, including wind compensation when navigating via an NDB. This is not the case for private pilots in many other nations.

An interesting byproduct of having an NDB receiver aboard your aircraft is that the RX frequency range also covers the AM broadcast band. Think about it: an AM broadcast station uses the same modulation as an NDB station.

This has two positive aspects:

- In the absence of a formal NDB NAVAID, you can track to or from any AM broadcast station. This gives pilots in less built-up areas another way to get to towns or small cities that may not have a NAVAID of their own: just dial the AM broadcast station’s frequency into the ADF, and you can track directly to or from the station’s transmitter! For this reason, AM broadcast station transmitter locations are plotted on flight charts in Canada and other nations; and
- Secondly, if you are out for a flight and want to catch the news or sports, then you can use the ADF receiver to tune into CBC or another station and listen to what’s happening. Every ADF receiver either has a speaker, or its audio is integrated into the aircraft’s audio bus. It is critical, though, to maintain situational awareness and be monitoring ATC frequencies at all times. Do not get distracted by the Canucks’ latest power play when you’re flying!

Back to the technical side of the discussion. The ADF requires two antennas on the aircraft: one antenna to receive the NDB signal, and another

“sense” antenna at right angles to the first that can sense whether the NDB is ahead of, or behind, the aircraft.

As a basic navigational instrument, ADFs are not normally duplicated in the aircraft.

VHF Omnirange Stations (VORs)

VORs were first deployed in the 1950s. For many decades VORs were the primary navigational aids for aviation worldwide, but they are slowly being overtaken by GNSS (satellite-based) navigational systems such as GPS and GALILEO. A typical VOR ground station is shown in Figure 4.



Figure 4 – VOR Ground Station

VORs operate in the VHF range of the spectrum and are typically assigned to frequencies between 108 and 118 MHz. They are a transmit-only AM ground-based facility and are commonly located at airports, or at strategic locations across the country. Typical VOR spacing is on the order of 100 to 200 nautical miles (NM).

VOR antennas on the aircraft are typically short verticals, or verticals mounted parallel to the aircraft’s fuselage on the lower side of the aircraft. VORs are always duplicated on commercial aircraft: two receivers and two antennas.

A VOR site is surveyed and constructed to be physically oriented to reference magnetic north. The VOR transmitter emits two signals simultaneously:

- A reference signal that is defined as being “North”; and
- A second signal that electrically sweeps through 360 degrees at 30 Hz, i.e. thirty full 360-degree rotations a second.



Modulation is AM. Each VOR station also transmits a CW identifier at 5 WPM every ten seconds. As with NDBs, pilots must verify the ID before using the NAVAID.

The VOR receiver on the aircraft analyzes both signals and determines the aircraft's bearing *to* or *from* the VOR station mathematically. The time delay between reference "North" and reception of the rotating signal is displayed on the VOR cockpit instrument. The instrument places the aircraft on one of 360 "radials" from the VOR station.

Pilots can follow a particular radial to a VOR, or track outbound on a chosen radial from the VOR. Long distance flight plans are made up of segments between VORs. In a sense, a VOR's radials define highways in the sky that aircraft can follow to get to their destination.

VORs do not interact with other aircraft systems in any way. VOR signals are usable to ranges of hundreds of miles and are thus suitable for long range navigation.

Distance Measuring Equipment (DME)

An aircraft on a particular radial may need to know how far it is from the VOR station. There are two ways to determine this.

A simple solution that was relied on in the mid-20th century was for the aircraft navigator to determine the direction to two VOR stations and then plot the corresponding two radials on a map. The aircraft is located at the point where the two radials cross.

A more modern technological solution relies on a ground-based service called DME (Distance Measuring Equipment). DMEs are usually co-located with a VOR ground station. Airborne DME electronics are commonly integrated with the aircraft's VOR receiver, because the two services are invariably used in tandem.

The aircraft DME unit initiates a distance measurement by transmitting an "interrogation" pulse to the DME ground station on an assigned channel between 960 - 1215 MHz. The DME ground station replies to this request with a short message. The time delay between the interrogation pulse and the DME station's reply is

used to calculate the aircraft's distance from the DME ground station. This calculation is performed by the aircraft's equipment. The distance, by convention in nautical miles (NM), is displayed in the cockpit.

Thus, the VOR/DME equipment aboard an aircraft in flight can determine both the compass direction to the VOR/DME facility to one degree resolution, and its distance from the facility in NM. This fixes the aircraft position quite precisely and improves situational awareness for both the flight crew and ATC.

Computer systems on board the aircraft such as the autopilot can use VOR and DME information to navigate the aircraft from departure through a series of VOR and VOR/DME ground stations towards the destination. Pilots can monitor the flight's progress and deviate from the flight plan only as necessary throughout the flight.

Instrument Landing System

VORs and NDBs can get an aircraft to its destination airport, but an additional facility is required to guide the aircraft to landing. In VFR conditions, a commercial airliner can be landed manually, but to support reliability an additional system is required to assist aircraft landing in weather conditions of poor visibility or heavier weather.

An instrument landing system (ILS) provides this capability. There are two aspects of an ILS: the localizer beam, and the glideslope.

The localizer is a VHF signal on a channel between 108.10 MHz and 111.95 MHz that is directed outwards horizontally from the runway and centred exactly along the runway centreline. An ILS receiver in the aircraft tells the pilots (or the autopilot) whether the localizer is left or right from the aircraft's flight path so that the aircraft can be lined up correctly on the runway's extended centreline. See the vertical line indicator in Figure 5.

The localizer provides horizontal guidance, but a second component of the ILS needs to be used to direct the descent of the aircraft towards the runway. This is called the glide slope, and it provides vertical guidance for the autopilot or the humans controlling the aircraft.



The glide slope receiver in the aircraft tells the pilots whether the correct descent path is above or below the aircraft. It displays a horizontal line that represents the glide slope location. If the aircraft is above the glide slope, then the aircraft must be guided gently down to intercept the glide slope indicator. If the aircraft is below the glide slope, then it must hold altitude until the glide slope intercept indicator is centred and be kept there until landing. A correct instrument indication has the horizontal and vertical indicators centred as shown in the righthand instrument in Figure 5.

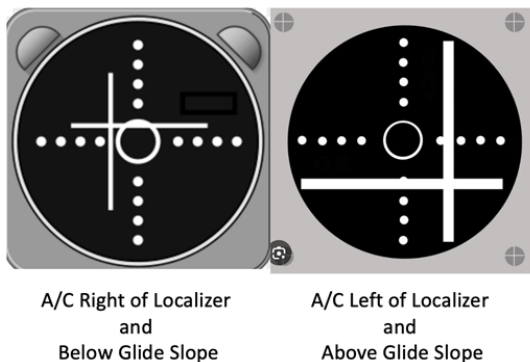


Figure 5 – Conceptual ILS Display

A successful ILS approach will result in the aircraft landing exactly 1000 feet from the threshold of the runway. This 1000 foot standard accounts for minor errors, wind effects, and other factors.

If an aircraft is certified for auto-land, then the ILS can legally be flown to the tarmac by the autopilot. Despite the fact that is a certified system, most pilots are of the opinion that while auto-land is not an inherently “scary” experience, it is a situation that needs to be monitored very carefully.

Usually, pilots will disengage the autopilot at 400 feet AGL and conduct the aircraft landing manually.



A/C on Localizer and On Glide Slope

The localizer and glide slope are tested and re-certified at least annually to ensure that they are functioning properly.

Redundancy

Commercial aircraft have multiple VOR receivers and DME units. This provides backup, should one of the devices suffer a failure. Computers onboard modern aircraft can also cross-reference VOR/DME results with GNSS data (see below) and other onboard navigational equipment to fix the aircraft’s position with very high accuracy.

In my relatively short aviation career my colleagues and I only experienced one event involving the failure of a navigational system, and this was traced (after a diversion to YYC in Calgary) to a component failure in one of our VOR receivers. Replacement of the broken VOR at YYC allowed our flight to continue. In aviation, safety is key and conservatism pays off. Diverting to YYC was a smarter decision than continuing the flight eastbound, even if the other VOR/DME unit appeared to be working.

ATC Radar

No article on commercial aircraft radio systems would be complete without a discussion on radar.

There are two classifications of ATC radar:

- Primary Surveillance Radar (PSR) uses ATC’s ground-based radar transmitter to illuminate targets in flight and detect their echoes. This allows ATC to see targets out to several hundred miles from the radar ground station, and to determine each target’s velocity using Doppler shift. No systems on board the aircraft are involved in this process.
- Secondary Surveillance Radar (SSR) augments PSR by interrogating the aircraft’s transponder, requesting altitude and other information from the systems aboard the aircraft.

Operationally, ATC combines both the PSR and SSR returns from each aircraft to allow display of the controlled airspace on the air traffic controller’s screens. Figure 6 shows a typical aviation radar installation.



Figure 6 – Aviation Radar Site

PSR can detect any object within the radar system's coverage. An escaped child's balloon, a large flock of birds, or that enthusiastic paraglider who has unwittingly ascended into controlled airspace will be detected as a primary target. Additionally, should an aircraft lose electrical power, for example, then ATC's radar will still detect it as a "primary target". ATC will lose the additional information from its SSR interrogation of the transponder.

The general procedure for ATC detection of an unidentified primary target will include asking aircraft in the vicinity whether they can see the target, and if so to provide ATC with further information. I was flying with a private pilot student in the lower mainland when ATC asked aircraft in the area if they could see an unidentified PSR target. My student and I were able to provide ATC with a description of the object - a hot air balloon that had wandered into YVR "Terminal" airspace by mistake. Such cases are documented and are assigned for investigation, and may result in fines or other enforcement action by Transport Canada Aviation.

Onboard Radar

Radar has been deployed on board commercial aircraft for many years. Airborne radar systems are of two types:

- Weather radar systems which look ahead of the aircraft to identify, locate and classify weather; and
- A radar altimeter.

Weather Radar

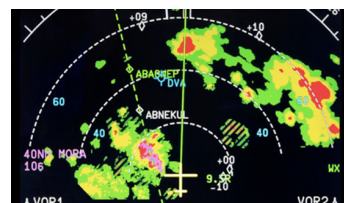
Airborne weather radar operates in the 8 to 12 GHz region. A patch antenna and servo motors in the nose of the aircraft keep the antenna pointed in the desired direction through interface to gyroscopic stabilizers or to other orientation systems aboard the aircraft. The pilots can direct the radar in a particular direction as well. Figure 7 shows a microwave patch antenna on an airliner and a typical cockpit weather display.

Figure 7 – Weather Radar Antenna and Cockpit Display



The use of pulse Doppler radar enhances target detection, and airborne radar can detect clouds, adverse weather, other aircraft, and even turbulence and flocks of birds. Range is on the order of 200 NM.

Radar targets are plotted on a display in the cockpit and pilots can refer to this to make decisions about the need for course alteration for weather avoidance. Any such changes must be approved by ATC.



Ground Proximity Radar

The second type of system on board is called "ground proximity radar" or a GPWS (Ground Proximity Warning System). GPWS is a radar system designed to alert pilots if their aircraft is in immediate danger of flying into the ground, or into an obstacle. This may also be called TAWS (Terrain Avoidance and Warning System).

This radar system operates between 4200 and 4400 MHz.

Ground proximity radar is frequently depicted on television and in movies as a tension device.



The typical dramatic refrain “TERRAIN! TERRAIN! PULL UP! PULL UP!” before a spectacular explosion emphasizes the critical situation in the aircraft to the audience.

In real life, however, pilots are incredibly skilled and professional, and barring a catastrophic event the possibility of this type of warning is near zero. Certainly a non-emergency approach or regular departure that generates this type of warning from the GPWS would be a major embarrassment for the pilot flying. That said, some airports such as those in mountainous areas are challenging both for landing and takeoff, but it would never be normal to receive these warnings.

Radar Altimeter

A radar altimeter backs up the barometric altimeter in an aircraft. It provides an altitude in (typically) feet AGL (Above Ground Level) for the aircraft. This is used by the pilots during their approach to landing to ensure that the published approach procedure for each airport is being followed accurately.

The barometric altimeter in every aircraft also provides aircraft altitude, but this altitude will be relative to sea level, not the altitude of the airport!

For example, if an airport is located at 1000 feet above sea level (ASL), then an appropriate barometric altitude for the aircraft at a waypoint close to landing may be 1500 feet. This is 500 feet AGL, and pilots reading the altimeter must remember to mentally subtract the field elevation to determine that they are 500 feet AGL.

This is easy with numbers like 1000 and 500 feet, but if the airport is at 2345 feet and your waypoint altitude is 2471 feet, the mental math is not easy! A radar altimeter cross checks the mental calculation and provides an absolute, accurate measurement of the aircraft’s height AGL.

Radar altimeters usually operate on frequencies between 2000 and 3000 MHz. The radar antenna is located on the underside of the aircraft’s fuselage.

Satellite Navigation Systems (GNSS)

Modern commercial aircraft are equipped with satellite-based navigation systems. Termed GNSS (for Global Navigation Satellite System), these systems utilize signals from satellite constellations including GPS, GLONASS (Russian), GALILEO (EU) to precisely locate the aircraft with very high precision.

GPS is the most common GNSS used by commercial airliners and can typically fix an aircraft’s location with an accuracy of a couple of meters.

I have written a column here in *The Communicator* [about GPS](#) before, and described how it works in a fair amount of detail. The satellite constellation uses digital spread spectrum to superimpose the signals from many satellites into a fixed bandwidth of spectrum. GPS receivers use clever mathematical techniques to “de-spread” (separate) the signals from multiple satellites and then use embedded subtle time references in the distinct signals to compute the receiver’s location in 3D space.

Signals from the GPS satellites are in a broadband digital format and centre around about 1575 MHz. GPS antennas on the aircraft (redundancy) are located on the top half of the fuselage so that they can “see” the satellites.

The GLONASS and GALILEO systems vary in the technical details but operate essentially in the same manner as does GPS.

Use of GPS Navigation

GPS geolocation is used by commercial airlines in several capacities:

- For most efficient en route navigation (travelling from A to B);
- For takeoff and departure from an airport up to cruise altitude;
- For approach and landing phases of flight; and
- In many cases, for taxiing on the ground to or from the gate to the active runway.

Let’s look briefly at each of these scenarios:



En Route Navigation

Air routes based entirely on GPS have been developed by international aviation regulators. Convenient waypoints may be defined based on geo-coordinates, and airliners can fly efficiently between these waypoints during their journey.

Unlike older NAVAIDS, GPS waypoints do not require expensive development and maintenance of ground stations.

Takeoff, Departure, Approach and Landing

As above, aircraft can rely on GPS waypoints for departure from and arrival to airports. No ground infrastructure is needed. If air traffic increases or issues with current waypoints are discovered, then new waypoints can be created without any infrastructure or maintenance expense.

Taxi

GPS works to help get our automobiles from A to B on the ground, so it is just as efficient to allow aircraft in the taxi phase of their journey use GPS to move around the airport. This replaces expensive ground-based aircraft movement systems, many of which historically had performance and maintenance issues.

Other Aircraft Radio Systems

Our journey through the complex world of aircraft radio systems is almost complete. Let's conclude our overview with a short discussion on emergency locator transmitters (ELTs), aircraft data link and telemetry systems, passenger telephony systems, and onboard WiFi.

Emergency Locator Transmitters

Every commercial aircraft must include an emergency locator transmitter. These units transmit on two standard frequencies, 121.5 MHz and 406 MHz. ELTs activate automatically when a threshold G-force is exceeded. Typically, this force will be generated in an airplane crash so that search and rescue teams can locate the downed aircraft.

ELT antennas are generally located on the top of the fuselage, and the devices operate from internal batteries. ELTs must be certified and tested periodically.

Data Link, Telemetry and Other Systems

These services are provided by commercial service providers like Inmarsat. They are satellite based and operate on frequencies around 1500 MHz. Wide bandwidth channels are assigned to a particular flight through aircraft logon at the satellite, and are used to provide a data link between the cockpit and the airline's flight operations office. Keyboards and printers in the cockpit allow the pilots to receive weather updates, schedule updates, and the like, and to provide reports to their flight operations office on the progress of, or issues concerning their flight.

The data link is also used for periodic status reporting on aircraft components and flight systems. This happens automatically, and can be used by flight operations to identify maintenance issues or other anomalies automatically. Flight operations will be notified of fuel levels, engine status, hydraulic, electric and other systems and similar information. Any anomalies in aircraft movements (such as a very steep turn, or an overly rapid descent) are also reported automatically.

A pilot colleague who worked for a large vacation package airline told me of repeated inquiries from his flight operations office whenever he and his crew flew into a mountainous airport in the Andes in South America. The published approach procedure required the aircraft to essentially "dodge a bunch of mountains", and the aircraft telemetry system did not like the aggressive aircraft movements that the standard procedure required. It would report him and his colleague to flight operations every time they were on that route. Flight operations understood, but they still had to follow up on the telemetry warning!

The last service provided by Inmarsat is the telephone service provided to passengers through those clunky "seat back" telephones that used to be on just about every aircraft. Should the rare passenger choose to use one of these telephones, their conversation is encrypted and then transmitted through the Inmarsat data link channel.

New services have evolved to replace Inmarsat and provide more capable data and WiFi services to passengers. The relatively new Starlink



service, for example, can provide not only telephone service but broadband Internet to passengers as well. I would expect that these new satellite data services will only grow in capability and popularity.

Where to Put All These Antennas?

We have described a significant number of radio systems. A critical factor is the placement of all of these antennas on the aircraft. Figure 8 shows the typical location of many of the antennas for the services we have discussed on the airframe of an Airbus 320.

Decisions on antenna placement are an engineering challenge and effective antenna placement is based on engineering experience, simulation, and deep analysis. In general, antenna placement is constrained by the function of the associated radio system, and where it “needs to look”. GPS and data link antennas need to be on top of the aircraft so that they can see their satellites. Radar antennas need to be in the nose, and VOR, DME and ILS antennas need to be able to see the surface of the earth. ADF antennas receive LF signals, so their placement is less critical. HF antennas are similar, but as they transmit with about 100 watts they need to be isolated from the antennas for sensitive receiver systems. And so on.

Once can see why aviation radios and cockpit instruments can be so expensive. All this equipment needs to function in a challenging environment and resist interference from other system whilst generating as little interference as possible itself. Size is a constraint, as is power budget and heat generation.

And all these systems must be function correctly, stand up to extremes of heat and cold, be easily repairable or replaceable, and they must endure and continue to function despite human error.

Thinking about these factors can shortly convince anyone that when they see an aircraft cost figure of (say) \$50M or more, that there are good reasons behind it.

Conclusion

That’s it for this issue.

Undoubtedly the pilots amongst our readers will have many suggestions in regard to systems (such as the magnetic compass, VORTACs or inertial navigation) that I did not discuss, or in the level of detail to which some of the NAVAID technologies were described. Brevity is important in any column.

My apologies if I have left out some important details, or not described the nuances of many systems or flying techniques in sufficient detail. If there is sufficient interest I could continue this discussion in a subsequent column.





This has been a whirlwind, but nonetheless fairly complete tour of the radio systems and their technology on modern commercial aircraft. While this is not “amateur radio”, the Editor and I have received quite a few requests for a column on this topic, so I hope that you as well found it of interest.

The next time you take a flight, whether for business or pleasure, I hope that this article has given you a bit of insight into the variety of radio systems in modern aircraft and their role in ensuring that you get safely to your destination.

Feedback on Radio Ramblings is always welcome and may be directed to the Editor, or directly to me at mcquiggi@sfu.ca. Thanks for reading!

73,

~ Kevin VE7ZD / KN7Q

References:

Reference for most of this material is the Transport Canada Aeronautical Information Manual (AIM), in the “COMMUNICATIONS, NAVIGATION AND SURVEILLANCE” section. The manual is available for free download at

https://tc.canada.ca/sites/default/files/2025-03/aim-2025-1_access_e.pdf

Other reference material can be found on Wikipedia, at <https://wikipedia.org>.



In just a few weeks, one of the most popular summer operating events will kick off, the "Route 66 On the Air Special Event"

Route 66, established on November 11 1926, as part of the U.S. Highway System, stretched approximately 2,448 miles, from Chicago, Illinois to Santa Monica, California, passing through eight states: Illinois, Missouri, Kansas, Oklahoma, Texas, New Mexico, Arizona and California. Known as the "Main Street of America" and later dubbed the "Mother Road" by John Steinbeck in his 1939 novel *The Grapes of Wrath*, it became an iconic symbol of American mobility and opportunity.

CBARC(W6JBT) Citrus Belt Amateur Radio Club, since 1947 located in Highland, California (San Bernardino County), will be hosting this yearly event celebrating the 26th anniversary of the event.

TheRoute 66 SE will run from September 6th 0001Z up to September 14th 2359Z

There will be a TOTAL of 24 stations with 1x1 callsigns from W6A up to W6Y, these stations are located or will be operating near the original Route 66, from Santa Monica up to Chicago.

This year will be a special year for the event as we will have a total of 5 rover stations, W6S, W6T, W6V, W6W and W6Y, but specially W6Y will be an Aeronautical Rover station operating from the air on 2meters simplex 146.490 the operator will be Bill Hartsell N3SWH retired USAF Colonel.

All the details and instructions are found at the CBARC website at www.W6JBT.org



Another RFI Tracker

Sniffing RF Noise with an Oscilloscope

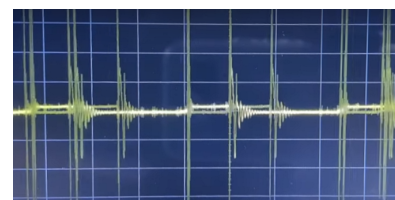
A handy electronics trick whether you're an electronics enthusiast or a curious tinkerer, here's a neat trick to add to your toolkit.. Using an oscilloscope to sniff out radio frequency (RF) noise from everyday devices. This lesser-known technique, which doesn't require any fancy equipment beyond what you likely already have, can reveal fascinating insights about the electromagnetic noise generated by common gadgets.

All you need is your oscilloscope and a simple loop antenna, which you can easily create from a standard oscilloscope probe. To make the loop antenna, take your oscilloscope probe, remove the cap, and connect the ground wire to the probe tip. This forms a small pickup loop that's surprisingly effective at detecting RF noise. By moving this makeshift antenna around a device, you can capture and analyze the electromagnetic signals it emits, identifying their frequency and characteristics.

Let's explore how this works by examining a few devices on a typical workbench. First up is a USB charger, a device most of us have lying around. When the loop antenna is placed near the charger, the oscilloscope screen lights up with a strong signal. Capturing the waveform reveals a repeating pattern of pulses, with a thin pulse followed by a stronger one that fades into a ringing pattern. Using the oscilloscope's cursors, the frequency of these pulses is measured at approximately 60 kHz. This is likely the power converter's switching frequency, as USB chargers typically oscillate pulses through an inductor and capacitor to maintain a steady 5-volt output. Zooming in on the ringing



portion of the waveform reveals an additional frequency of about 2.879 MHz, indicating potential interference at this range and its harmonics.



Using the loop antenna to probe a laptop, starting with the trackpad, the oscilloscope captures what appear to be data bursts, repeating at a frequency of about 904 kHz—nearly a million times per second. Within these bursts, a smaller oscillation is detected at 50 MHz, which could explain intermittent noise observed on the 6-meter radio band when the laptop is in use.



Moving the antenna near the laptop's screen reveals more digital noise, including a square wave with a ringing pattern. The frequency of these pulses varies, suggesting dynamic data transmission to the display, possibly a sync pulse.

This simple oscilloscope trick is not only fun but also incredibly useful for diagnosing electromagnetic interference in electronic devices. By transforming a standard probe into a loop antenna, you can explore the hidden RF noise emitted by everyday gadgets, from chargers to laptops. Whether you're troubleshooting interference or just satisfying your curiosity, this technique offers a window into the invisible world of electromagnetic signals. So grab your oscilloscope, make a loop antenna, and start sniffing out the noise around you!

~ based on a video by Kevin Loughin KB9RLW

See Kevin's video at <https://youtu.be/SF6RM-el6sY>

A BRIDGE TOO FAR

For Now!

by DOUG JEFFERY VA7JDJ

No this isn't a Siskel and Ebert review of the 1977 war movie! In the past couple of months a group of SEPAR/SARC members have been working to setup an Amateur Radio Emergency Digital Network (AREDN) connection at our repeater site on Concord tower.

AREDN, is an RF based high speed digital network that also has the ability to communicate over standard internet paths. It uses mesh networking techniques to connect nodes together looking for the best path for the data and to provide redundancy in the event that any specific node is unreachable. The hardware used is commercial long range wifi equipment that has been re-programmed with AREDN's firmware. There is no central node required to form a network, so as little as 2 units can join together and pass data back and forth. If more nodes are within range the network will automatically adjust to add or remove them as they move into or out of reception range.

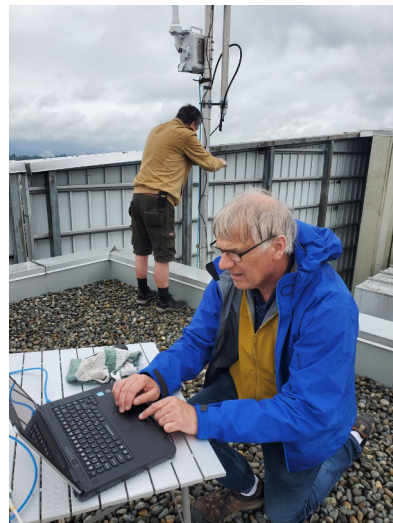
AREDN is an amateur radio project (arednmesh.org) with the stated objectives:

The AREDN™ Project's focus is Emergency Communications (EmComm). It seeks to provide hams a means to implement this technology in practical ways to support local and regional emergency communications needs. To that end, the project's objectives are to enable hams to:

- Stand up a working mesh node with minimal expertise and effort
- Configure the mesh network automatically so that advanced network knowledge is not needed
 - Use low-cost, reliable commercial equipment
- Define standards for inter network integration
- Support those in the process of designing and implementing EmComm networks
- Refine the software to make implementation easier, more reliable, and more manageable

The benefit of having such a network available is to have an easy to deploy system that can provide a digital backbone for communications. This could take the form of email, chat applications, telephone, video streams and more. All without the need for traditional internet service, which could be limited or offline in an emergency.

Trying to leverage the knowledge and skills of hams on Vancouver Island we've reached out people from the Mid Island AREDN group



SARC Member Derek VE7VPG, to
and in the background Mike
VE7YEG

WiFi Scan							
SNR	Signal	Chan	Enc	SSID	Hostname	BSSID	Mode
26	-69	172	-	AREDN-5-v3	10.58.176.156	f4:e2:c6:3a:b0:9c	My Ad-Hoc Mesh
24	-71	172	-	AREDN-5-v3	-	be:5c:d2:42:07:2d	My Ad-Hoc Mesh

who have successfully implemented a wide area network. In late May, Chris VE7TOP from Nanaimo and Derek VE7VPG came for a visit to share their AREDN experiences. Over a Saturday breakfast and later at the OTC they talked with members about various aspects of the AREDN system. Chris has kindly loaned us some hardware for testing. Our first objective was to install a dish at our North repeater site. We planned to make a link from there to the AREDN node on Mount Benson, a few kilometers West of Nanaimo.

We left the OTC in the middle of a hard rain shower and headed to the repeater site. We installed a short mast to setup the dish on and have fed Ethernet cable from the radio room up to the roof to connect with the dish. AREDN nodes tend to be fairly self contained. Often, as is the case in this installation, the only connection needed is a network cable that can provide Power Over Ethernet (POE). While the dish was being installed Derek tested the connection using his portable setup. He was able to “hear” Mount Benson, but unfortunately the link quality didn’t prove to be good enough to make the connection. In spite of the adverse conditions we did manage to get the dish mounted and generally aimed towards Mt Benson, but we were not able to make the link. It was a bridge too far!

We were able to make another visit to the site in mid-July and with some careful adjustments of the dish position we were able to hear Mt. Benson. On this day Derek was able to connect to Mt Benson from his home in Comox and confirm that

the Mt. Beson node was hearing us from Surrey. The signal was weak which led to us getting an error message “RF blocked, latency”. We felt like we were closer to having a solution, but still not quite able to connect.

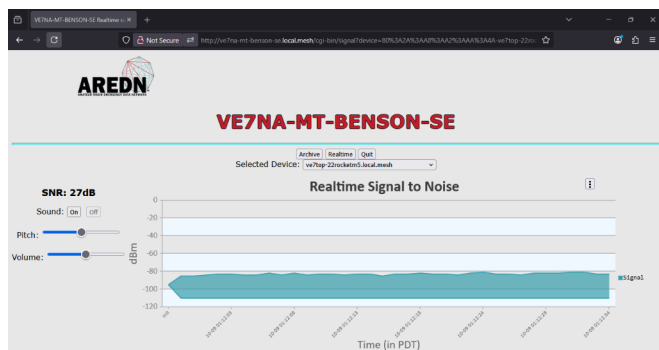
The Mid Island AREDN group have a regular Zoom meeting. In the last call I asked if other’s had experienced this same error and if there was a solution. Most AREDN connections are over shorter distances than we were trying. It was shared that the system works very well for connections up to about 38km and will figure out timing automatically. The link we are trying to establish is around 90km. When a packet of data is sent from Concord to Benson the dish at Concord expects to get an acknowledgement that the packet was successfully received, but because of the distance, there is a delay in getting the signal. The Concord dish then re-transmits the packet and the problem repeats itself. Eventually the node at Benson refuses the signal because of the repeated failures.

Working with the people from the Mid Island AREDN group we are exploring the cause of these failures and hope to test several possible fixes so that we can change the description from “A Bridge Too Far” to “Contact”!

~ Doug Jeffery VA7JDJ



Chris VE7TOP from the Mid-Island AREDN Group

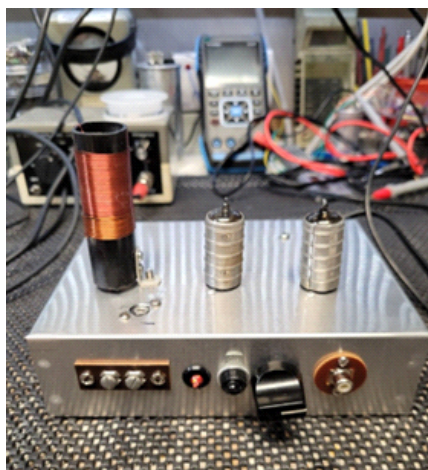


AREDN VE7NA-MT-BENSON-SE mesh status									
Location: 49.149815 - 124.050796 Mount Benson SE 120 Degree South East BW 5 Mhz Ch 172									
Help Refresh Auto Cloud Mesh Quit									
Node Name	LAN Hostname	EQ	NRQ	SNR	Quality	TxRxBps	Distance	Service Name	
Current Neighbors									
VE7DXX-BENSON-LINK (Active)	lan.VA7DXX-BENSON-LINK	100%	100%	32/30	100%	9.8	13 miles		
VA7DXX-BENSON-LINK (Active)	lan.VA7DXX-BENSON-LINK	100%	79%	36/16	100%	4.9	10 miles		
VA7DTE-BENSON-LINK (Active)	lan.VA7DTE-BENSON-LINK	100%	100%	44/31	99%	36.1	11 miles		
VE7DDE-BENSON-LINK (Active)	lan.VA7DDE-BENSON-LINK	88%	100%	32/23	100%	29.2	6 miles		
VE7NA-BIRWING-MTBENSON (Pending)	lan.VA7NA-BIRWING-MTBENSON	88%	100%	34	100%	4.9	4 miles		
VE7NA-COST-LAKE-VT-BENSON-LINK (Active)	lan.VA7NA-COST-LAKE-VT-BENSON-LINK	61%	62%	25	49%	1.6			
VE7NA-RE-BENSON-200 (Active)	lan.VA7NA-RE-BENSON-200	100%	100%	100%	100%	<1	<1 mile		
VE7NA-200-200-200 (Active)	lan.VA7NA-200-200-200	100%	100%	23	2%				
Remote Nodes									
VA7DXX-RMP-1	LAN Hostname	ETS						Service Name	
		1.10							

purchased a 1 MHz crystal from Digikey for the LO but was dubious as to whether the crystal would oscillate. The circuit calls for a NTE650 1 Mhz 'parallel resonant' type HC-33 crystal. On completion of the transmitter I found the Digikey one failed to oscillate, I suspect loading on the grid. I confirmed this by using a 1.8Mhz HC crystal, and the oscillator happily fired up, although in the 160 meter range... No worry on QRM as no antenna was connected and only 3 milliwatts! So the hunt was on to find an unobtainium NTE650! I found one at Marvac Electronics in the States... \$17 USD plus postage. The second thing was to locate a suitable 50 pF variable trimmer. I found a 25 pF which I will pad with a small fixed ceramic capacitor in parallel to peak the output tank circuit.

I used a lot of period type components in assembling the transmitter, such as those Bakelite terminal strips, connectors etc. I even used an NE-2 neon pilot lamp. No LED's here. Audio input is provided by an RCA jack. I will build a simple stereo to mono combiner cable to provide audio from an MP3 player, the irony!

But back to why. Well AM radio is on its last legs it appears throughout the world, in fact, in many countries in the developed world AM is officially dead. Even FM is now on shaky ground giving way to DAB, and other digital transmission formats. Here AM is now limited to News talk radio or traffic watch and even foreign language broadcasts. Music radio is now forgotten. Those days of listening to CFOX 1470, (yes that call sign was in the Montreal West Island in those days),

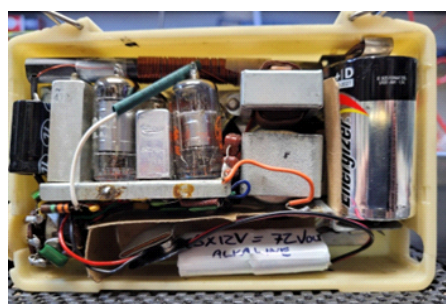
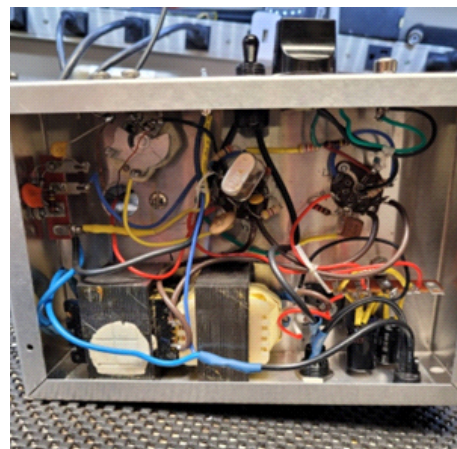


and also CKGM as a child on my trusty 6 transistor Sony radio, are fond memories for me. I had built many crystal radios in those days and stringing a long wire out the backyard to pick up local AM stations, no

battery required. Hey, I even used the finger stop on our telephone as an antenna! Improved listening for me was obtained by tinkering with single transistor amplifiers using 2N107's or Raytheon CK722's to boost the audio to my X-telephone operator

headphone. Ah the memories, so I will load up the MP3 with those classic '60s and '70s pop hits and fire up those old AA5 radios, and vintage transistor ones too.

Shown below is an early '50's battery tube radio in my collection. One volt filament tubes. Note the 72V battery as the original 67.5 is unobtainium. A bunch of 12V garage door batteries fit the bill.



And a 1963 vintage Sony 7 transistor radio freshly refurbished.

~ Gary VE7GPR

Radio Amateurs of Canada

(ISED) Releases New Documents for Amateur Exams

by DAVE GOODWIN VE3KG, RAC Regulatory Affairs Officer

On May 30, 2025, Innovation Science and Economic Development Canada (ISED) published three important documents related to the Amateur Radio examinations:

ISED updated “[RIC-1 - Guide for Examiners Accredited to Conduct Examinations for Amateur Radio Operator Certificates](#)” which sets standards for Amateur Radio certificate examinations and provides direction to Accredited Examiners (AEs) on the conduct of exams.

This update to RIC-1 makes three important changes:

1. ISED has given specific direction on the conduct of “virtual examinations,” that is, examinations conducted over the internet.
2. ISED has dropped geographic restrictions for AEs. AEs in any province or territory may now examine candidates in any province or territory.
3. ISED has clarified that both the candidate and the AE must be in Canada at the time of the exam.

These changes were initiatives by ISED and were the subject of a Canada-wide consultation with AEs.

On that same date, ISED published two new documents specifically for the Basic exam:

1. A sheet of formulas and block diagrams. These are fully labelled. ISED is offering these for training purposes only.
2. A very similar sheet of formulas and block diagrams with all labels and context removed. These may be used as approved

reference material during all Basic examinations starting on July 15, 2025.

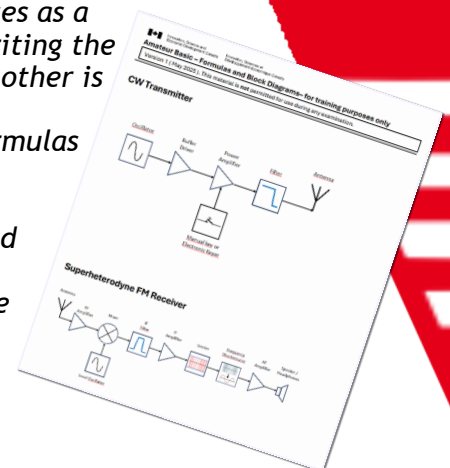
These new documents were RAC initiatives. They were created by the members of the RAC Examination Standards Committee (RAC-ESC-CNE).

~ Dave Goodwin, VE3KG
Regulatory Affairs Officer
Radio Amateurs of Canada

Examination requirements are described in [RIC-3](#).

New reference document for ISED Amateur Radio examinations

This [link](#) provides a zip file, containing two PDF files. One file is a set of labeled formulas and block diagrams, which may be used by amateur candidates as a study aid prior to writing the Basic exam, and the other is an identical, but unlabeled, set of formulas and block diagrams, which may be used as an aid while writing the exam. These files are available for use as of July 15, 2025.



Quoting from the last TCA

“ISED recently discovered that in their database, there are 261 “clubs” with call signs allocated where the trustee is known to be dead. It is the responsibility of the club to keep their sponsorship arrangements up to date. Most clubs are responsible enough to do this, but some never give it a second thought. We don’t know how many clubs have trustees whose deaths have not been reported to ISED but There must be some. RAC’s President, Allan Boyd, VE3AJB, told me that his club, the Manitoulin Amateur Radio Club (VE3RMI) has a provision in their club’s constitution to ensure the continuity of the trustee for the club’s call signs. Does your club have any provision like this? Do you know what to do when your trustee passes away? Or resigns? Or leaves the club? Are you just leaving it to “someone” to take care of this?”

RAC Response to proposal to US FCC about satellites

Radio Amateurs of Canada (RAC) has taken note of the concerns raised by Canadian and international Amateurs regarding a proposal submitted to the US Federal Communications Commission (FCC) by AST, a US-based company.

The proposal seeks limited authorization to use the 430 MHz to 440 MHz spectrum - including other non-Amateur bands - for satellite telemetry, tracking and control (TT&C) functions during unspecified emergency scenarios.

RAC was aware of this proceeding, designated as FCC Docket 25-201 and opted not to comment during the initial submission phase. This decision aligns with guidance received from our US counterpart, the American Radio Relay League (ARRL), who has now submitted their formal comments.

RAC intends to participate during the reply phase of this proceeding, which concludes on August 5, 2025. We will coordinate closely with the ARRL to ensure

7.03 Repeater Trustee

The club repeater system callsigns fall under the club repeater trustee and shall be registered with Innovation, Science, Economic Development Canada (ISED) under the Spectrum Management Amateur Radio Service Center. These callsigns though being in the name of the trustee shall mention that they are in care of the MARC Inc.

Should the repeater trustee leave the club or no longer agree to be the repeater trustee or if the trustee should pass away then these callsigns need to be registered in another name of someone willing to take on this role. It is the responsibility of the Club Executive either the President or Vice President to make sure proper notifications are made to ISED and the transition is done. As the executive changes within the club then new elected officers must be made aware of this section of our by-laws.

our response is both complementary and constructive. Our shared goal is to uphold and defend Amateur Radio access to the 430-440 MHz band.

RAC has also consulted with Innovation, Science and Economic Development Canada (ISED), ensuring that Canadian regulatory authorities are aware of the proposal and the concerns voiced by Canadian Amateurs.

The Amateur community has expressed strong reservations about potential interference with weak-signal activity in the vicinity of 432 MHz, as well as with Amateur satellites operating between 435 MHz and 438 MHz.

While some online commentary has exaggerated the implications of the proposal - including claims that Amateur access to this spectrum is in jeopardy - it is important to note that such assertions are unfounded.

Nevertheless, RAC remains committed to defending the interests of Canadian Amateurs and will formally respond to the FCC in the upcoming phase of the proceeding.

~ Dave Goodwin, VE3KG
RAC Regulatory Affairs Officer Dave Goodwin, VE3KG

FT8

Getting Started

A Beginner's guide to the popular ham radio mode

FT8 is a mode in WSJT-X software developed by Dr Joe Taylor K1JT. It is a beneficial mode when solar conditions act up and propagation is poor. There is also an earlier FT8 tutorial by Kevin McQuiggin VE7ZD/KN7Q at https://archive.org/details/SARC_Communicator_2021-03/page/14/mode/2up.

Have you ever tuned across the HF bands and heard a distinctive, robotic sound? Chances are, you were listening to FT8, one of the most popular digital modes in amateur radio today. Designed for making contacts under challenging conditions, FT8 allows operators to communicate across the globe even with low power (QRP), compromised antennas, or high urban noise levels.

FT8, which stands for “Franke-Taylor design, 8-FSK modulation,” was created by Joe Taylor, K1JT, and Steve Franke, K9AN. It is an 8-frequency shift keying mode bundled within the free WSJT-X software suite. Initially designed for weak-signal multi-hop sporadic E propagation, its incredible efficiency quickly made it a runaway success on the HF bands and beyond, with operators even using it on frequencies as high as 3.4 GHz.

The mode’s appeal lies in its ability to decode signals up to -21 dB below the noise floor, far exceeding the performance of traditional CW (Morse code). A typical FT8 contact (QSO) is not a conversation but a minimal, automated exchange of call signs, signal reports, and grid squares, all completed in about one minute. Each transmit and receive sequence lasts roughly 15 seconds, making it a rapid and efficient way to confirm contacts.

To get started, you’ll need to download and configure the WSJT-X software. The most critical initial step is ensuring your computer’s clock is precisely synchronized to within one second of Universal Coordinated Time (UTC), using a program like NetTime. Without accurate timing, you will be unable to decode signals.

Once WSJT-X is running, you’ll be greeted by a colorful waterfall display. This is your visual representation of the band, with each signal appearing as a colored bar. You can click on the waterfall to set your receive frequency. A crucial tip for a clean signal is to adjust your audio output level from WSJT-X so that your radio’s ALC meter shows little to no movement, preventing distortion.

When you see a station calling “CQ,” you can double-click their signal to initiate a contact. The software will automatically generate and send the appropriate responses. To call CQ yourself, find a clear spot on the waterfall, set your frequency, and click “Enable Tx.” The software will handle the sequence, and you can watch as stations from around the world reply.

A final pro tip is to enhance your experience with a free companion program called GridTracker. It interfaces with WSJT-X to plot every station you hear on a world map, providing an instant, intuitive visual of which bands are open and where signals are coming from, turning a list of call signs into a stunning display of global connectivity.

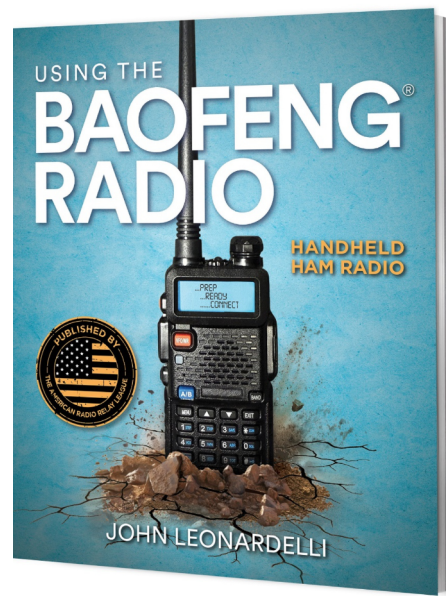
~

A helpful beginner video: <https://youtu.be/YyWX0i87P0o> and a detailed guide https://www.q4ifb.com/FT8_Hinson_tips_for_HF_DXers.pdf

Using the Baofeng Radio

Your Guide to a Handheld Ham Radio

by JOHN LEONARDELLI VE3IPS



Using the Baofeng® Radio is a comprehensive gateway to the world of ham radio using Baofengs. It gives you everything you need to start using your handheld ham radio on the air legally, safely, and effectively. Get ready to use your radio to stay in touch with family and friends whether you are off the road, off the grid, or you want access to a reliable backup communication device. Discover uses for your ham radio, including how to relay your signal through a mountaintop repeater so you are heard far away, and a step-by-step guide to digital operations.

The book details operating with the popular UV-5R, the rugged UV-82, and the DMR-enabled DR-1801UV. Using the Baofeng® Radio covers how to program and use your radio with only the front panel and built-in settings. It then elaborates on using the free programming software CHIRP to program memory channels using a laptop or home computer. Finally, it describes how to program your radio to communicate around the world using Digital Mobile Radio (DMR), which you can access through repeaters or mobile hotspots.

To prepare you for new activities and adventures, Using the Baofeng® Radio provides detailed information on your radio's settings

screens. It also includes cheat sheets with the most frequently used settings and helpful tips from longtime Baofeng user and ham radio enthusiast John Leonardelli, VE3IPS.

~ Using the Baofeng® Radio is now shipping. Order from the ARRL online store or find an ARRL publication dealer; ARRL Item No. 2240, ISBN: 978-1-62595-224-0, \$19.95 retail. For additional questions or ordering, call 1-888-277-5289 toll-free in the US, Monday through Thursday 8 AM to 7 PM and Friday 8 AM to 5 PM Eastern Time. Outside the US, call (860) 594-0200.

John's website is at ve3ips.wordpress.com

Reg VA7ZEB reports that this new Baofeng UV5R Mini has just tested RF clean and may be of interest for the budget conscious. For only \$30 CAD with free shipping you get a beautiful colour screen, USB-C charging, and Bluetooth programming. I personally haven't tested or even touched it, but I am basing this only on reports from others.

<https://www.youtube.com/watch?v=JbTmYW1HSiY>

<https://www.aliexpress.com/item/1005009735247331.html>

~ Reg VA7ZEB



7300 9700 SIG



A Special Interest Group for the iCOM 7300, 7610, 9700 and other compatible models

Noise reduction and your USB cable

A guide and possible solution

by JOHN SCHOUTEN VE7TI



**John Schouten
VE7TI**

Has both an iCOM 7300 and 9700 and is fascinated by the 'hidden' features of these transceivers.

Noise reduction in Icom transceivers like the IC-7300, IC-7610, and IC-9700 is critical for optimizing performance, particularly in environments with high radio frequency interference (RFI). As part of our SARC Basic Amateur Radio course I show students a video that I've made whereby, using a common AM portable radio, tuned to a quiet spot on the dial, you can find sources of radio frequency interference (RFI) in your home (see my YouTube video at: <https://www.youtube.com/watch?v=p8i8HmxeHnM>). Also see page 29.

If you viewed the video, then you have seen just how prevalent noise is in an average home. After I bought and connected my IC-7300 to my computer, I saw and heard a number of 'birdies' on a couple of the HF bands - some were quite severe. I set out to investigate the source.

Modern amateur gear using software-defined radios (SDRs) utilize RF direct sampling. In the IC-7300 and IC-7610 for HF/50 MHz, in the IC-9700 for 144/430 MHz, and down-conversion IF sampling for the IC-9700 at 1200 MHz, This enhances sensitivity but can make



Left, this IC-7300 has multiple birdies across the 20m band. Right, after replacing with well-shielded USB cables with ferrites at each end, the birdies flew away. They were even less when I added a larger ferrite with several windings of the cable though it.

receivers susceptible to external noise sources. Effective noise management involves both onboard features and external measures, such as high-quality USB and audio cables equipped with ferrite cores. The IC-7300 and IC-7610 feature built-in noise reduction (NR) algorithms that process digitized signals in Field Programmable Gate Array (FPGA) technology to suppress background noise while preserving desired signals. By combining SDR with FPGA technology, engineers and hobbyists can build highly efficient, scalable, and versatile radio systems that can handle complex signal processing tasks with ease.

The IC-7300's NR is adjustable via the menu, offering subtle improvements for SSB, CW, and digital modes, though it may not match the precision of external DSP units. The IC-7610, with its dual receivers, provides enhanced NR capabilities, allowing fine-tuning for each band, which is particularly effective during crowded band conditions or DX operations.

The IC-9700, designed for VHF/UHF, also incorporates NR, but its efficacy depends on proper configuration for digital modes like D-STAR or satellite operation. Operators can adjust NR settings through the touch-screen interface, balancing noise suppression with signal clarity to avoid distortion.

Real radio signals vary in amplitude. Birdies put out a solid signal. Two common sources of birdies are your monitor and network switch. It's easy to spot monitor birdies - just turn the monitor on and off. If it is the culprit, you will see solid lines on both the waterfall and spectrum display when it is off. The RFI birdies from a monitor can range from about 15 to 20 dB above than the noise

floor. And, if you really want to see birdies, disconnect your external antenna. What you are left with are RFI oscillations from devices in close proximity.

These iCOM transceivers connect to your computer for CAT control, logging and digital modes. They use a USB A-B cable, such as those used in older printers and other peripherals. Poor-quality USB and audio cables are a common source of RFI, often manifesting as 'birdies' – spurious signals visible as persistent spikes or lines in the waterfall display. These artifacts, caused by electromagnetic interference (EMI) from unshielded or low-grade cables, can obscure weak signals and degrade the user experience. For example, USB cables connecting the radio to a PC for CAT control or digital modes can act as antennas, picking up stray RF or introducing noise from computer power supplies. Similarly, audio cables for external speakers or microphones can couple noise into those systems.

Purchasing high-quality, well-shielded USB and audio cables with ferrite cores at both ends significantly mitigates this issue. Ferrites suppress high-frequency noise by increasing cable impedance to unwanted RF, effectively



Left, a USB A-B cable with no ferrites, and right, a similar cable with ferrites at both ends.

choking EMI. For optimal results, Type 31 for HF, or Type 43 ferrite materials for VHF/UHF are recommended, as they target the frequency ranges used by these transceivers. Alternatively, wrapping cables through ferrite cores multiple times or using clamp-on ferrites can also enhance suppression.

Clean cabling ensures a noise-free waterfall, critical for spotting weak signals.

Incorporating ferrite beads on both ends of USB and audio cables can further enhance noise reduction. Sometimes a larger ferrite with more windings may be required. Ferrites are passive components that suppress high-frequency noise, filtering out unwanted signals before they enter the transceiver and preventing noise generated by the transceiver from radiating back into the cables.

Proper grounding and bonding of equipment are also crucial, as they minimize ground loops, a common source of noise.

Users have reported that poor-quality USB cables, generally lacking a tightly braided shielding, can still introduce birdies, especially in high-RF environments like multi-transmitter setups... even with ferrites. For instance, a Reddit user noted that the IC-7300's USB interface can pick up RF even at low power (5 watts), suggesting internal RFI issues that external ferrites alone may not fully resolve; in that case, a USB galvanic isolator can further reduce noise by breaking ground loops.

The IC-7300 and IC-7610's waterfall displays are invaluable for identifying birdies, as their high-resolution, real-time spectrum scopes reveal noise spikes that might go unnoticed in audio alone. The IC-9700's waterfall, tailored for VHF/UHF, similarly helps pinpoint interference during satellite or weak-signal work.

Additionally, environmental factors play a significant role; positioning the transceiver away from potential noise sources and ensuring optimal antenna placement can greatly reduce interference. Beyond cables, grounding the transceiver and ensuring a robust power supply (e.g., 25A for the IC-7300 to avoid current starvation) are essential. The IC-7610's dual spectrum scopes and the IC-9700's full-duplex operation amplify the need for clean signals, as noise can disrupt simultaneous main and sub-band monitoring.

Clean cabling ensures a noise-free waterfall, critical for spotting weak signals. By combining onboard NR, high-quality shielded cables with ferrites, and proper grounding, operators can minimize birdies and achieve clearer reception across all bands. For further details on cable specifications, consult Icom's USB Port Settings in the user manual or community resources like QRZ forums.

Effective noise reduction techniques, including the use of high-quality cables with ferrite beads, proper grounding, and attention to environmental factors, are essential for optimizing the performance of the Icom IC-7300, IC-7610, and IC-9700. By addressing these issues, operators can significantly enhance audio clarity and improve overall communication quality in the amateur radio community.

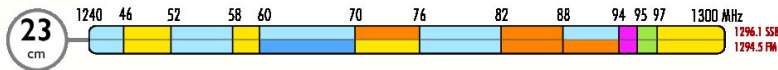
~ John VE7TI

See the video at <https://youtu.be/bGxwRFpN3Q> for additional RFI reduction hints.



WA5VJB's "Cheap Yagis"

Looking for a 1.2 Ghz solution?



I have an iCOM IC-9700 2m/70cm/25cm band transceiver, but I have never really pursued contacts on 1.2 Ghz, mainly as there was not much activity in the area. But, with the increase in new users (and satellites), it's time to give it a try. In Canada and the US, the 1.2 Ghz (23cm) band is 1240 to 1300 Mhz, with 1294.5 as the National Calling Frequency. Having perused the high price of commercial antennas, I decided that I would look for and build a suitable antenna for experimentation.

I found one... a multi-element antenna that was designed by Kent Britain WA5VJB. Kent has a page (and a company) devoted to "[Cheap Yagis](#)" for various bands, although the "official" name is the Controlled Impedance Yagi because of their wide bandwidth. This antenna is ideal for rovers, and is good for a fixed station on a budget. It can be built for less than \$20.

The boom material typically is wood or PVC tubing, 1/2" or 3/4" sold in home centers. If you choose wood, outdoor varnish, paint or deck stain will work to weatherproof the antenna. Do put a dab of RTV over the coax connection after verifying the SWR of the antenna.

Elements can be secured as WA5VJB suggests, with epoxy or RTV, or alternatively, as Fred W0FMS does, file a small groove around each element very close to where it protrudes out of the 1/2" boom (on each side), and force on "push-nuts" (also called "speed-nuts") on each side of the element, for a positive hold. Alternatively, solder a small brass washer or nut onto the "J" shaped side of the element before mounting, and clip the "push-nut" to the other side upon mounting on the boom.

Fred also suggests winding a small loop of the coax into a small RF choke under the feedpoint to act as a balun, but WA5VJB states that this step is unnecessary. Fred claims to be a purist...

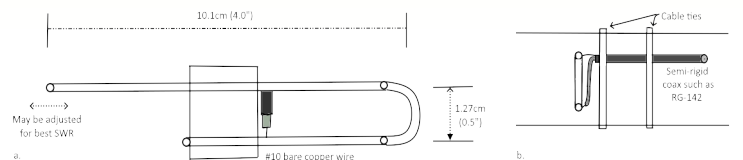
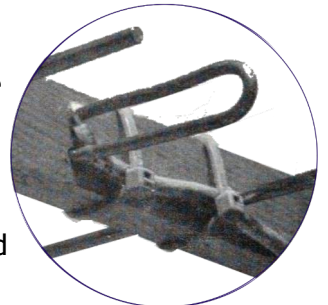


Figure a: Driven-element dimensions, see the table below.
Figure b: Detail of feedline connection.

Element	R	DE	D1	D2	D3	D4	D5	D6	D7	D8
Length	4.3	**	3.9	3.8	3.75	3.75	3.65	3.6	3.6	3.5
Spacing	0	1.7	2.8	4.0	6.3	8.7	12.2	15.6	19.3	23.0

In the table you have all the numbers you'll need to build the 1.2 GHz Cheap Yagi. 3mm (1/8") brass welding rod works well and it is solid and inexpensive. A low loss coax is needed, and RG-142 is well-shielded and good to 8 GHz.



The photo [above] is a closeup of the area around the feedpoint. The image is the best I could find on-line at my 'go-to' resource, the [Digital Library of Amateur Radio & Communications](#). "23 dB RL" is written on the bottom of the boom. This stands for return loss. When measured on a network analyzer, his reflected power was 23 dB weaker than the forward power. Return loss is a more precise way of measuring SWR, especially when the values get very low. Twenty-three dB RL works out to about a 1.15:1 SWR. Typical performance is 13.5 dBi gain, 30 dB front-to-back ratio. Making each element 2.5mm (0.1") longer will give good performance between 1260 and 1280 MHz for AMSAT ATV systems. The F/B ratio will drop to 20 or 25 dB, but the gain will still be 13.5 dBi.

~ John VE7TI

With on-line information from WA5VJB, W0FMS and CQ VHF magazine - [December 1998](#)

RigPi

Probably
compatible
with your rig



The RigPi Station Server (RSS) software, when paired with a Raspberry Pi, transforms this compact single-board computer into a powerful hub for amateur radio enthusiasts, enabling a wide range of ham radio operations and general computing tasks with minimal hardware.

Designed specifically for ham radio operators, RigPi allows users to remotely control radios equipped with USB-based Computer Aided Tuning (CAT) capabilities, such as the Icom 7300 or Yaesu FT-991A, using only a Raspberry Pi 3B+ or 4B, a microSD card (16GB or larger recommended for wear leveling), a 5.1V, 3A power supply, and a USB A-B cable for radio connectivity. By installing the RigPi 4 image, released on August 4, 2025, and available on rigpi.net or GitHub, operators can access a browser-based interface compatible with any internet-connected device—Windows, Mac, Linux, Android, iOS, or Chromebook—without requiring additional software.

Leveraging the Hamlib library, which supports over 200 radio models and 30 antenna rotors, RigPi enables precise control over frequency, mode, and other radio settings, making it ideal for remote operation from anywhere, whether across the room or across the globe, particularly for hams facing antenna restrictions. Beyond basic radio control, RigPi excels in digital mode operations, offering pre-installed software like WSJT-X and Fldigi to support modes such as FT8, RTTY, and PSK31 for weak-signal communication and contesting.

For radios with built-in USB audio CODECs, no additional hardware is needed, as the Raspberry Pi can handle audio input/output and CAT-controlled Push-to-Talk (PTT) directly. This setup allows operators to engage in long-distance digital contacts with ease. Additionally, RigPi's logging system is robust, supporting multiple logs, automatic QSO data transfer from WSJT-X, and

RigPi 4 Station Server is a Raspberry Pi-based server for Amateur Radio operators. It can serve multiple simultaneous users, providing rig control, audio through VoIP, Morse code keying, rotor control, logging and call book lookup.

integration with the ARRL Logbook of the World (LoTW) via TQSL. Call sign lookups are facilitated through an onboard FCC database for U.S. hams or an optional QRZ XML subscription for global data, streamlining contact tracking for awards or contests.

The software also includes DX cluster monitoring, enabling operators to track unworked or unconfirmed callsigns, enhancing DXing efforts to connect with rare or distant stations. RigPi's versatility extends to multi-operator and multi-radio scenarios, making it a valuable tool for radio clubs or shared stations.

The server model allows multiple users to control different radios simultaneously via separate browser sessions, provided the radios are connected to the Raspberry Pi, potentially through a USB hub. For voice communication, RigPi incorporates a Mumble server for Voice over IP (VoIP), enabling remote SSB or FM operation using the radio's USB audio capabilities and a Mumble client on a remote device like a smartphone or computer. This eliminates the need for the RigPi Audio board in many cases, broadening accessibility for modern radios.

In emergency scenarios, RigPi shines by supporting radio control and logging without internet or cell service, requiring only a power source (e.g., a battery) and a compatible radio, making it a reliable choice for disaster response or portable operations like Field Day. The Raspberry Pi's Raspbian Linux operating system, bundled with the RigPi image, also serves as a general-purpose computer. The PIXEL Desktop environment supports tasks like email, web browsing, word processing, and spreadsheets, accessible locally with a monitor, keyboard, and mouse or remotely via VNC (e.g., RealVNC). This dual functionality makes the setup practical for non-radio tasks, such as managing club schedules or drafting documents.

For tech-savvy users, RigPi's open-source codebase, licensed under MIT and hosted on GitHub, invites customization using HTML5, PHP7, jQuery, Ajax, and MySQL (MariaDB). Operators can modify the browser interface, add

new features, or integrate unsupported radios with basic programming knowledge and access to the Raspberry Pi's file system via SSH or VNC.

While RigPi offers extensive capabilities with just a Raspberry Pi, some limitations exist without additional hardware.

Morse code (CW) keying via a paddle or keyboard requires the RigPi Keyer board with its K1EL WinKeyer chip, though some radios such as the ICOM 7300 support CW through CAT commands. Older radios lacking USB audio CODECs cannot support VoIP or digital modes without the RigPi Audio board, and I/Q spectral display (panadapter) functionality is similarly dependent on this board.

Rotor control, while supported via Hamlib, requires a compatible rotor with a control interface. Security is a priority, with RigPi automatically updating the Raspbian OS, and users can enhance remote access security using VNC or OpenVPN to avoid risky port forwarding.

Practical applications include remote station operation while traveling, shared access for club members, portable setups for field events, or experimentation with digital modes and custom software development. To get started or explore further, visit rigpi.net or the RigPi GitHub repository for the latest software and documentation.

Download the RigPi image now: <https://f005.backblazeb2.com/file/rigpi-download/RigPi4rc.zip>

~ RigPi



Raspberry Pi in Palm

The Raspberry Pi is small enough to fit in the palm of your hand. The Raspberry Pi is a complete computer. In addition to running ham radio programs, you can use it for email, browsing the web, and find software for just about any application you wish.

Satellite Tracking

The AnyTone 878 portable receives a major firmware update

Amateur radio enthusiasts have just received exciting news: the popular Anytone AT-D878 handheld radio has gained a powerful new feature through its latest official firmware update. Previously available only in the open source 'OpenGD77' firmware, built-in satellite tracking with Doppler correction is now available for the Anytone hand-held and is now officially integrated into the Anytone lineup.

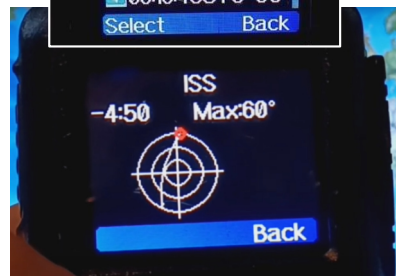
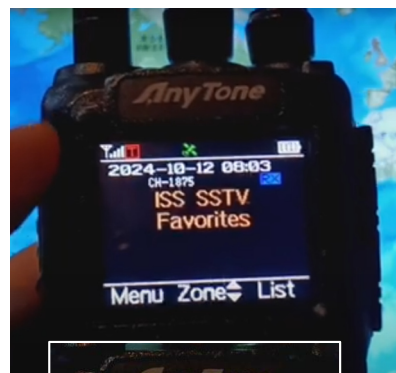
New Icons and Menu Options

Right from the outset, users will notice a visible change on the radio's display. A new green satellite icon now appears on the top line, signaling that the radio has successfully acquired GPS. Navigating into the menu system, there are additional icon upgrades, including an option labeled "Satellite." Entering this menu presents two main choices: Location and Satellite.

- Location allows operators to set their coordinates either through GPS synchronization or manual entry.
- Satellite opens a live interface displaying upcoming passes, current satellite data, and tracking information.

Real-Time Satellite Tracking

Once a satellite is selected, the radio presents a wealth of useful data. This includes the satellite's azimuth, elevation, name, and pass prediction.



There is a descriptive video at:
<https://www.youtube.com/watch?v=Y5pOHynTk7Y>

Users can monitor when a satellite rises above the horizon, how high it will climb, and exactly when it will set. For instance, when tracking the International Space Station (ISS), the radio can display that a pass will begin in a few minutes, rise to a maximum elevation—say 60°—and then fade as it crosses to the opposite horizon.

The firmware even provides a simple graphical interface: a red dot shows the satellite's position relative to the operator, while lines on the display trace its path across the sky. While not designed as a full visualization tool, it offers practical situational awareness for handheld operators.

Automatic Doppler Correction

Perhaps the most groundbreaking feature is the radio's ability to automatically adjust for Doppler shift. As satellites move rapidly across the sky, their transmitted frequencies shift slightly, requiring the operator to manually retune in order to maintain clear communications. With the new firmware, the 878 now takes care of this automatically—constantly correcting both transmit and receive frequencies to stay locked onto the satellite. This means no more manual channel programming or constant fine-tuning.

Setting Up the Firmware

Getting started with satellite tracking on the Anytone is straightforward:

1. Install Firmware v3.04 - the update that enables this functionality.
2. Adjust GPS and Time Settings - in the CPS software, ensure GPS is turned on and the correct time zone is configured. Accurate timing is critical for satellite prediction.
3. Load Satellite Data - under the "Tools" menu in CPS, there is an option to write satellite data into the radio. This populates the prediction tables and ensures that upcoming

passes are available in the handheld's menu.

Once configured, the radio requires no additional setup. Simply select the satellite from the list, wait for the pass, and transmit.

Supported Models

Currently, the update supports multiple versions of the Anytone handheld series, including the 878 series with GPS capability. Reports suggest it is particularly tied to newer hardware, such as versions featuring the green button model of the radio, but exact compatibility may vary.

A Game-Changer for Amateur Satellite Operators

The new satellite tracking and Doppler correction features added to the Anytone 878 are very similar to those available in the OpenGD77 firmware for the Radioddity GD-77 and compatible radios. Both systems offer real-time satellite pass predictions, the ability to automatically adjust frequencies for Doppler shift during a satellite pass, and menus that let you select satellites and track their azimuth and elevation. Like the Anytone update, OpenGD77 enables your radio to automatically populate and update frequencies, handle Doppler tuning, and provide pass timing and tracking—making satellite communications much more user-friendly for handheld operators.

For years, handheld operators looking to work satellites relied on third-party firmware or external tracking tools. The addition of official satellite tracking with Doppler correction represents a major milestone. Operators can now take their handheld out into the field, track satellites like the ISS, AO-27, and other amateur satellites directly on the radio, and communicate during passes without the hassle of manual tuning.

~

Ham TV again from the International Space Station!

by JIM ANDREWS KH6HTV



Jim Andrews, KH6HTV
publishes the free ATV
Journal via email. All past
issues are archived at:
[https://kh6htv.com/
newsletter/](https://kh6htv.com/newsletter/)

Following years of work by the ARISS team, the HamTV module has been successfully reinstalled and is now active. You can see live video from the ISS as received by a chain of stations at: <https://live.ariss.org/hamtv/>

HAMTV is the name of the Digital Amateur Television (DATV) transmitter on board the Columbus module of the International Space Station (ISS). It transmits Digital video and audio in MPEG-2 format using the DVB-S protocol in the 13 cm band.



The original HamTV unit was installed on the ISS in 2013 and commissioned in April 2014 and was used for a number of ARISS school contacts in 2016 - 2018. The unit failed in 2019, and was brought back to earth for repair. It was returned to the ISS on the SpaceX SpX-30 flight on March 21st 2024. Unfortunately a lengthy "topology reassessment" was then required due to space issues in the Columbus module.

For more information and details on how to receive the ISS DATV signal, see the BATC web site:

https://wiki.batc.org.uk/HAMTV_from_the_ISS

~ Jim KH6HTV

For those interested in learning more, the British Amateur Television Club (BATC) hosts a detailed resource on the HamTV system at wiki.batc.org.uk/HAMTV_from_the_ISS.



Most amazingly, the balloon crossed directly over its launch site in Maple Ridge, BC, July 16, 2025, 42 days later. It was a strange route with many days of almost no travel or school-zone observing speeds of under 30 km/h, heading in the wrong direction, and going in loops over the oceans. The jet stream picked up and in 4 days it went from the west coast of BC to the west coast of Spain.

The balloon had some technical difficulties. We believe either one of the circuits became intermittent or, more likely, the solar panels drooped a bit so that for several days at a time they weren't pointing towards the Sun and so we couldn't get a location. Some of the websites we were using to report the location have gone down as well, but we still recommend this one which reported observations: <https://amateur.sondehub.org/#!mt=Mapnik&mz=7&qm=7d&mc=43.11301,-9.65149&q=VE7NFR-11>.

At publication, the balloon was lost somewhere near the end of its 2nd revolution. (Note that the route shown interpolates between observation data so is not the exact flight path).



In related news, the North Fraser Amateur Radio Club did extremely well at this year's **Floaty Awards** - the prestigious awards given for excellence in pico and high-altitude ballooning. A 15-minute condensed version of the show that was broadcast worldwide and to outer space can be seen at

<https://ve7nfr.com/thedipole/the-73rd-annual-floatie-awards-july-2025-the-pinnacle-of-amateur-radio-ballooning-achievement>

Thanks again to everyone for your support. We plan other launches but our next focus is for a high-altitude balloon (HAB) launch this summer. We will let you know when we have a date for it.

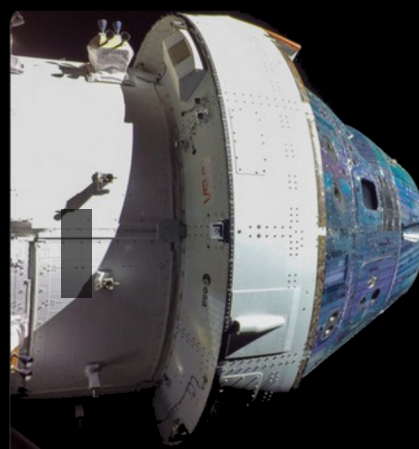
73,

~ Adrian VE7NZ, Scott VA7SL
and everyone at Mission Control.



NASA is looking for volunteers to passively track Orion during Artemis II's crewed flight around the Moon! This data will help NASA understand industry tracking capabilities for future Moon to Mars missions.

Responses are due Oct. 27. go.nasa.gov/4p1djjC





By REBECCA KIMOTO VA7BEC

Rebecca Kimoto VA7BEC is the Secretary and contest coordinator for the British Columbia QSO Party, held on the first full weekend of February each year.

Visit ORCA at: <https://www.orcadxcc.org/index.html>

The BCQP 2025 took place back in February. Results — for BC and outside BC — and the after-party report with number-crunching analysis were [announced](#) a couple of months ago. Certificates and plaques are undoubtedly decorating walls.

BCQP continued to attract active interest, substantiated by 421 logs submitted in 2025. Of these 421 logs, 50 were from BC stations, 40 from stations in other parts of Canada, 324 U.S. stations, and seven stations in DX entities.

Logs are a tangible indicator of participation. But due to the casual nature of QSO parties and the fact that logs are not a requirement of participation, the number of logs submitted may not accurately reflect actual on-air activity. In BCQP, for example, the log count is always tipped heavily toward U.S. participation, mainly, it seems, because U.S. operators tend to submit a log even if the QSO count is low.

A close look at submitted logs shows that 111 BC stations were on the air in 2025, but more than half of these stations did not submit a log. Were they only part-time participants, giving points to pals, and didn't keep a log? Did they jot down a few details, like callsign and "59," on a scrap of paper and then realized they didn't have all the necessary data for logging a contact? Did they lose the scrap of paper? Did they procrastinate too long about turning the scrap of paper into a Cabrillo file? Was the log too small—from the operator's perspective—to warrant the steps of submitting a log? Many possible reasons.

Another point of interest, at least from a participation standpoint, is that 24 VE7/VA7s in submitted logs were uniques. That is, they appeared in only one submitted log. Were they accidental participants, who were just tuning through the bands, heard a station calling CQ BCQP and answered? Or casual participants who only had a couple of hours that unfortunately

coincided with horrible CONDX, leading to one measly Q and not worth submitting a log for? Or a busted callsign of someone who didn't send in a log and thus doesn't show up reciprocally as a NIL (not in log) in the submitted log report? Again, many possible reasons, and no definitive answers.

I would say, from an organizer's perspective, no log is too small. A log of even one QSO will confirm that contact in a reciprocal log as well as the federal electoral district used in the exchange. This is important because, in many cases, an accidental BC participant may be the only active station in a particular federal electoral district or on just one mode. Anyone embarrassed by a low score should simply submit a checklog, which is used exactly as the name implies — as a log for checking (confirmation) purposes.

I would also say that perceptions of success are relative. For me personally, if I'm in a cut-throat weekend marathon contest and I don't hit 1,000 Qs, I'm disappointed. But my less-than-1,000 QSO total might actually be top-of-category when contest results are announced. So many variables at play. A perceived poor showing may turn out to be quite good indeed.

CONDX, local QRM, QSB and auroral creep are factors out of operator control. We have to make the best of whatever situation we find ourselves in, and find solace in whatever results we achieve. And that may lead to surprises, like a nice BCQP certificate.

Scores in BCQP 2025 were generally not of the record-breaking level that characterized 2024, but more log-submitting participants picked up tangible recognition. Just FYI, certificates and plaques went to 136 stations outside BC in 2024 and to 144 stations in 2025. Certificates and plaques went to 35 stations in BC in 2024 and to 43 stations in 2025.

The certificate program recognizes top BC scores in category of entry by federal electoral district and top scores outside BC in category of entry by province/state/DX entity. There are so many opportunities to pick up some lovely wallpaper for the shack or for the desktop.

On the topic of federal electoral districts, or ridings, anyone who participates in BCQP knows that the real treasure hunt multipliers for this QSO party are BC's federal electoral districts. Most QSO parties use county names but BC doesn't have counties so... federal electoral districts it is.

Every decade or so, the map is redrawn to reflect changing population density. A new map was applied to the federal election this past April. Therefore, a new multiplier list for BCQP purposes will go into effect with BCQP 2026. There are now 43 federal electoral districts in BC.

BC stations, check at elections.ca to confirm your federal electoral district. Even though some of the old riding names remain, the boundaries might have changed, and you (BC station) could be in a new district. If you voted in April, you'd know if there was a change. Then check the multiplier list to find the corresponding three-letter abbreviation used for BCQP purposes.

Stations outside BC, please listen to what BC stations provide in the exchange. Don't rely on a database of past riding abbreviations.

Note, that the three-letter abbreviations in the multiplier list are used for BCQP only. You won't find them used anywhere else.

BCQP 2025 was very successful. Comments from participants were very positive. Lots of compliments for BC operators who make the event welcoming and fun even when CONDX is not.

Let's party again in 2026. It's always a whale of a good time.

73,

~ Rebecca VA7BEC
BCQP Contest Coordinator

[BCQP 2025 Report](#)

For submitted logs, please go to [BC Results](#) and [Outside BC Results](#) on the BCQP website.



The PERformer

Winner in the 2024 ARRL QST Antenna Design Competition
A vertical antenna for 40 through 6 meters

by GREG MIHRAN KJ6ER

The [award-winning](#) PERformer (Portable, Elevated, Resonant) is a resonant one-band-at-a-time elevated quarterwave vertical antenna for 40M-6M sitting on a tripod or PVC ground spike with the feedpoint 4-5 feet off the ground and two elevated tuned linked radials 90° apart. This is a great portable antenna - easy to pack, fast to deploy, very effective and highly efficient!

I have computer modeled the antenna extensively in 4NEC2 and derived optimal whip and elevated tuned radial lengths. You will have to experiment in your own surroundings to fine-tune these, but I typically get <1.10:1 SWR on all bands. I have found through modeling, testing and extensive experience in the field, this elevated vertical is over 90% efficient and better than any ground-mounted version I have ever used. This means that when 100 watts is applied to the antenna, more than 90 watts are radiated! For comparison, a typical ground-mounted quarter-wave vertical antenna at resonance with four ground-coupled radials is only 37% efficient!

Elevated Tuned Linked Radials

The two elevated tuned radials are 90° apart to provide modest gain (0.3-0.5 dBi at the maximum radiation angle) and some directionality (3-4 dB front-to-back ratio) within the 90° span. If an omnidirectional radiation pattern is preferred, place the two elevated radials 180° apart (opposite). Having elevated tuned radials dramatically reduces near-field ground losses and increases directional gain versus a purely ground-mounted vertical with ground-coupled radials. With an antenna efficiency over 90%, I regularly get comments like: “you’re the loudest signal on the band” from POTA hunters.

The 20M-6M bands are all available using the 17’ telescoping whip. For 40M, I install a coil (*Chameleon™ M-COIL \$90 or Wolf River Coils™ Sport Forty \$35, both shown next page*) at the base of the whip. For the 40M radial, I clip the two 20M 16.5’ radials end-to-end with two fiberglass stakes (one at center, one at end) to have one elevated 33’ 40M radial.

Antenna System Parts List with Prices and Links (as of May 2025)

Here are the components I recommend for the PERformer (substitute as you wish):

- Chameleon™ CHA SS17 17' whip (US\$70) - chameleonantenna.com/products/stainless-steal-whip
- Furniture grade PVC (tripod alternative, US\$28 for 4 tubes) - amazon.com/gp/product/B0876M7C2B
- CHA spike mount for PVC (US\$65) - chameleonantenna.com/shop-here/ols/products/cha-spike-mount
- MACTREM™ 74" tripod (US\$60) - amazon.com/dp/B0CDKFJLX7
- Palomar Engineers™ RF Feedline Choke, 1.8-65 MHz (US\$30) - palomar-engineers.com/ferrite-products/Coax-Jumper-Choke-RG-8X-RFI-Range-1-8-65-MHz-30-dB-Noise-Reduction-1-5KW-PEP-Magnetic-Loop-Antenna-Choke-p159344870
- Pro Trucker™ Mirror mount with 3/8x24 to SO-239 stud (US\$12) - amazon.com/dp/B01G2QSNDC
- BNTECHGO™ bright orange 18 AWG radials (US\$18 for 100' spool) - amazon.com/dp/B01MPZJOYN
- Mueller™ BU-55 steel clips for the radials (US\$15 for 10 pieces) - amazon.com/dp/B00LPP8Q00
- Fiberglass 4' orange stakes to elevate radials (US\$20 for 20 stakes) - amazon.com/dp/B0BLTPJZG6

Traditional Calculations vs. 4NEC2 Computer Model Computations

Below are the traditional quarter-wave calculations (234 / f) vs. computer model computations for the 20M-6M bands. When using elevated radials rather than surface (or ground) radials, antenna efficiency rises significantly to over 90% due to less loss resistance from capacitive ground coupling (in series with the antenna's inherent radiation resistance). However, elevating radials also typically lowers the overall antenna impedance below 50 ohms due to its low loss resistance.

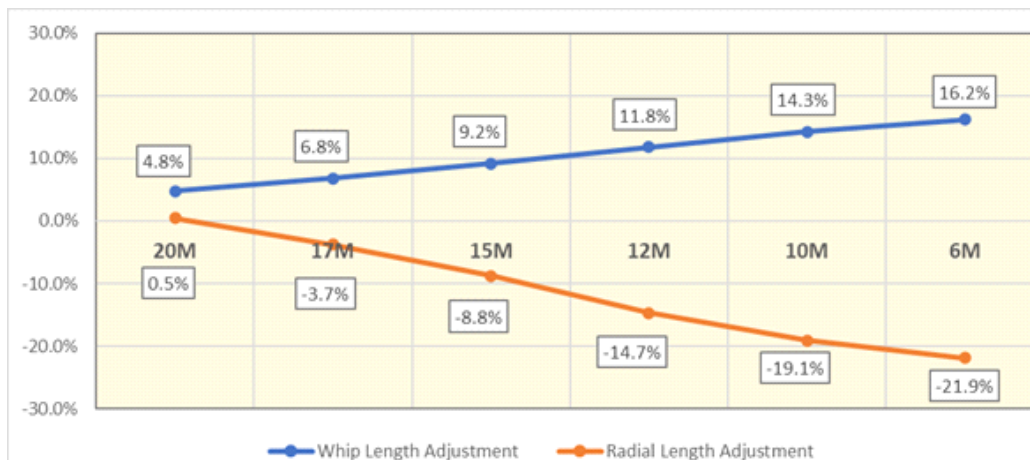
The best way to raise impedance is to angle the radials downward slightly from the feedpoint, typically 30-40°. If this so-called droop angle cannot be made big enough, the radiator can be lengthened up to 20% and the radials must be shortened accordingly. In essence, this can be thought of as off-center feeding a dipole. Note in the table below, the OCF % is calculated as 51% on 20M to 60% on 6M.

Thus, the model generated a longer radiator (+5% on 20M to +16% on 6M) and a shorter radial pair (+0.5% on 20M to -22% on 6M) to achieve optimal impedance. In the table, the elevated radial droop angle from the feedpoint to the radial end is calculated as 5° on 20M to 22° on 6M.

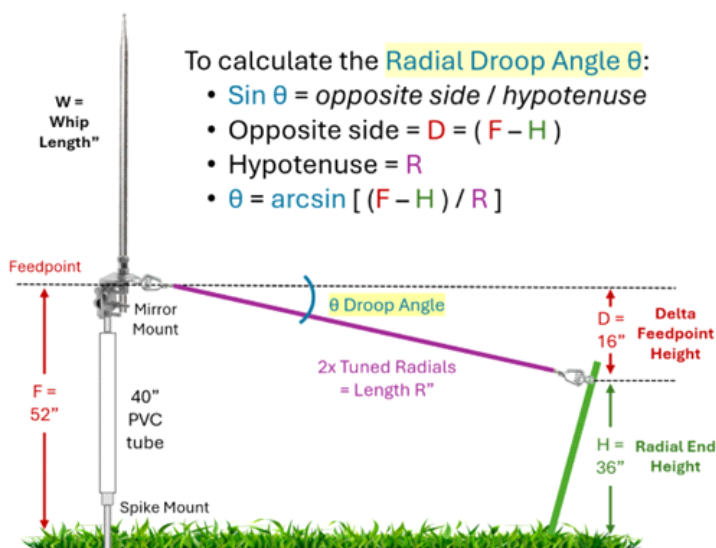
Note: Droop angle only applies when you are not using non-conductive segments within the radial lines.



Band	Target Freq (Mhz)	234 / f		Radiator				Counterpoise					
		Length	Inches	Length	Inches	Whip vs. Calc	Whip OCF %	Length	Inches	Radial vs. Calc	Radial End (in)	Radial End vs. λ	Droop Angle (deg)
20M	14.250	16' 5"	197	17' 3"	207	4.8%	51.1%	16' 6"	198	0.5%	36	5%	5
17M	18.140	12' 11"	155	13' 9"	165	6.8%	52.6%	12' 5"	149	-3.7%	36	6%	6
15M	21.350	11' 0"	132	12' 0"	144	9.2%	54.5%	10' 0"	120	-8.8%	36	7%	8
12M	24.940	9' 5"	113	10' 6"	126	11.8%	56.7%	8' 0"	96	-14.7%	36	8%	10
10M	28.400	8' 3"	99	9' 5"	113	14.3%	58.5%	6' 8"	80	-19.1%	36	9%	12
6M	51.000	4' 7"	55	5' 4"	64	16.2%	59.8%	3' 7"	43	-21.9%	36	16%	22



Calculating the Elevated Radial Droop Angle



Whether deploying the PERformer tripod or PVC spike mount, the feedpoint is approximately 52" above the ground and the radial ends are about 36" high when clipped to the fiberglass stake. Using the basic sin function (opposite side / hypotenuse), the droop angle can be approximated for each band. If using non-conductive segments in the radial lines, the droop angle will remain constant around 5°.

Fine-tuning the Antenna in the Field

While the computed radial length and end height for each band remains fixed, the antenna system resonance can easily and quickly be fine-tuned

with use of an antenna analyzer (or your rig's SWR meter) by slightly adjusting the length of the telescoping whip once the radials have been attached.

Since every portable deployment will have different soil and near field surroundings, I

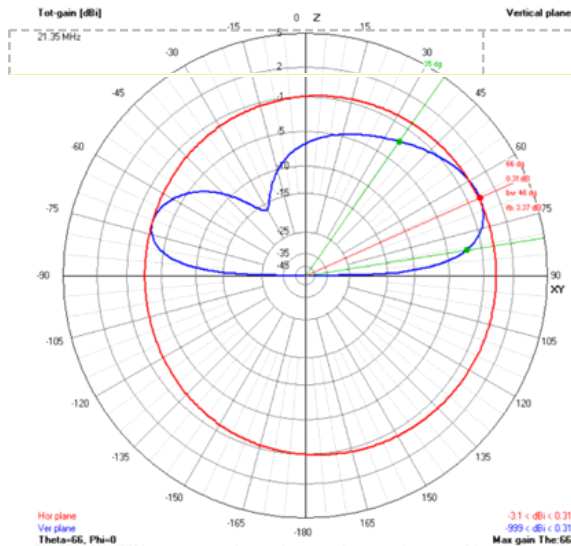
recommend remembering or documenting generally where to extend the telescoping whip initially for a particular band and then make finetuning adjustments from there. You will find that the precise whip length will likely vary at each deployment depending on those factors and other elements (when it comes to antennas, everything affects everything).

It is imperative that a good quality **RF choke** be inserted directly at the feedpoint so that the coax feedline does not become part of the antenna system as a third radial. If excluded, common mode currents (CMC) and radio frequency interference (RFI) will likely disrupt optimal antenna operation and cause issues with inconsistent radiation patterns and SWR measurements.

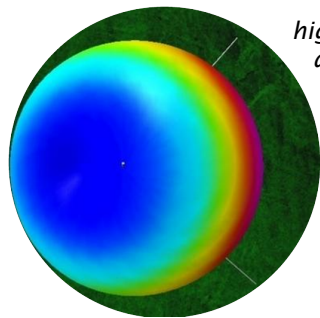
Because of the resonant characteristics of this antenna, an external antenna tuner is not typically required at the rig or antenna base if the SWR is 1.50:1 or less, potentially reducing any losses caused by these components and saving on packing. Resonant antennas are always the best and most efficient antennas!

On the next page is a 4NEC2 Computer Model Graphics Showing the Far-Field Radiation Pattern (vertical, horizontal planes) and Reflection Coefficient (RC) for 15M (21.350 MHz). Note the directionality evident in the vertical plane. The maximum gain of +0.31 dBi occurs at 24° off the horizon with a -3 dB beamwidth of 46° (-15°, +31°). The front-to-back is 3.37 dB. The reflection coefficient is a very high -51.2 dB.

As mentioned earlier, if omnidirectional coverage is preferred, simply place the two elevated radials 180° apart (opposite each other). This will negate the directionality and the front-to-back ratio.



4NEC2 Computer Model Graphics Showing the Colorful 3D Radiation Patterns as Seen from above for 15M (21.350 MHz). The purple and red edges of the radiation pattern



Field SWR Measurements for the PERformer Antenna for Each Band (20M-6M)

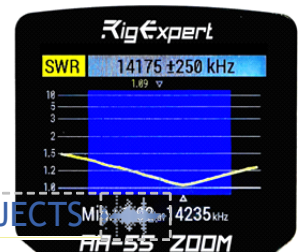
Note the very low SWR at band resonance and the broad bandwidth which typically covers the entire band. You will never need an antenna tuner! In fact, even with a 1.50:1 SWR, your power throughput efficiency is 96%.

Antenna Deployment Showing Tripod Configuration and Radial Clips.

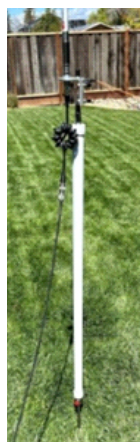
Mueller™ clips are fantastic antenna building components. They clip on and off easily for fast deployment and take-down. The silicon-coated radial wire alleviates annoying tangles in the field. One clip is used to combine both elevated radials at the feedpoint and another clip is used at the end of each elevated radial for the stake.

Elevated Radial Deployment with Radial Clip.

A Mueller™ clip at the end of each radial is attached to a non-conductive stake. A reliable trick to ensure tension on the radials is to insert the fiberglass stake into the ground at a 60° angle with the clip about halfway up the stake [below right]. Once attached, slide the clip up to the top until the radial is taut. A little sagging in the line is fine.



If not using a non-conductive radial segment insert (shown at the right in the 20M position), the droop angle from the feedpoint to the stake varies from 5° on 20M to 22° on 6M. In theory, a 30° to 40° droop angle will raise impedance close to 50 ohms. Given that these angles are less, the radiator was extended slightly, and the radials were shortened to achieve optimal purely resistive impedance at resonance.



PVC Tube with Spike Mount Deployment.

Most of the time in the field, I prefer to deploy my PERformer antenna using a PVC spike mount [shown at left] instead of a tripod, leveraging a 40" furniture grade PVC tube and the Chameleon™ spike mount (or a very small tripod).

I like the 40" tube length because it is not too tall for me to reach the telescoping whip to adjust it for the band of operation and still keeps the feedpoint elevated around 52". The non-metallic PVC tube is also optimal because, unlike tripod legs, it does not interact with the shortest antenna radials, especially on the upper bands (10M-6M).



PVC Top Cap with Mirror Mount
Stud and Bottom Cap for Spike Mount

In the top flat [end cap](#), I drilled a 3/8" hole for a 3/8-24 fine thread bolt and a 1-1/2" x 3/8-24 nut on the outside. I use split lock and fender washers for a rigid, tight fit. The bolt connects to a mirror mount with a [Fire Stik™ stud and SO-239 connector](#) on a short base-threaded aluminum rod (e.g., I cut down a WRC threaded extender rod). At the SO-239 feedpoint, I use a [Palomar Engineers™ RF choke](#) to alleviate common mode currents and prevent the feedline from becoming part of the antenna. Do not operate the antenna without this feedline choke, it is imperative for optimal performance. The [Chameleon™ 17' telescoping whip](#) screws into the stud and the length is easily adjusted for band resonance in the field using an antenna analyzer.

In the bottom flat end cap, I drilled a 3/8" hole for a 1-1/2" x 3/8-24 bolt to connect with the Chameleon™ spike mount. I typically try to insert

the spike about halfway into the ground for a stable base. In moist California soil, I can push the spike in the ground with my hand. If I am in a location with harder-packed soil, I use a rubber-head mallet to tap it in. With the spike and mirror mount, the feedpoint is up about 52" off the ground.

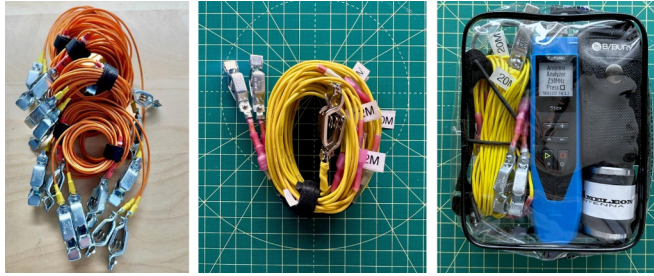
Elevated Tuned Linked Radial System Using Spade Connectors

The performance advantages of the PERformer are the elevated 52" feedpoint and the two elevated tuned radials placed 90° apart providing modest directional gain (+0.31 dBi, 3.37 dB front-to-back) within the span of the radials. Make sure span compass points are selected in the direction desired for extra gain. On the west coast, I place them northeast and southeast for great results across the North American continent.

When I initially modeled the antenna in 4NEC2, I input many different radial spans from 10° to 120° apart to determine how the span impacted gain and directionality. Ultimately, the optimal span was computed to be at 90°. As mentioned previously, placing the radials 180° apart (opposite each other) provides a balanced omnidirectional pattern.

I also modeled different numbers of elevated radials to determine what quantity provided the best performance. I concluded that any incremental number of elevated radials beyond two provided very little benefit and just added to the components to carry with the antenna. Furthermore, two elevated radials provide more antenna gain, efficiency and improved SWR over just one radial.

When I constructed my early antenna prototype a few years ago, I cut an individual pair of radials for each of the six bands (20M-6M) for model evaluation and optimization. Once I was satisfied with the results, I replaced the six pairs of radials with just one linked pair that included embedded [Wirefy™ spade connectors](#) for each incremental band segment. This significantly reduced the amount of wire I had to carry with the antenna.



Original Six Pairs of Radials

Replaced by One Pair (center) with Spade Connectors

I pack the linked radials with a [RigExpert™ 230 Stick](#), [Chameleon™ CHA M-COIL](#) (for 40M band operation) and a [BIBURY™ B12038A 19-in-1 Multitool](#) in a [zippered clear plastic travel bag](#) commonly used for travel toiletries. These bags are fantastic to carry any portable antenna essentials. They are made of thick clear plastic and are water resistant. I have several of them in differently sizes to neatly organize all kinds of components.

On the following two pages, more detail on the lengths and construction of the linked radial system is provided. For this radial pair, I use one Mueller™ clip to combine and connect the two elevated radials at one end to the mirror mount base, and a Mueller™ clip at the ends of each elevated radial to attach to the fiberglass stakes.

Antenna Configuration and Elevated Tuned Linked Radial System

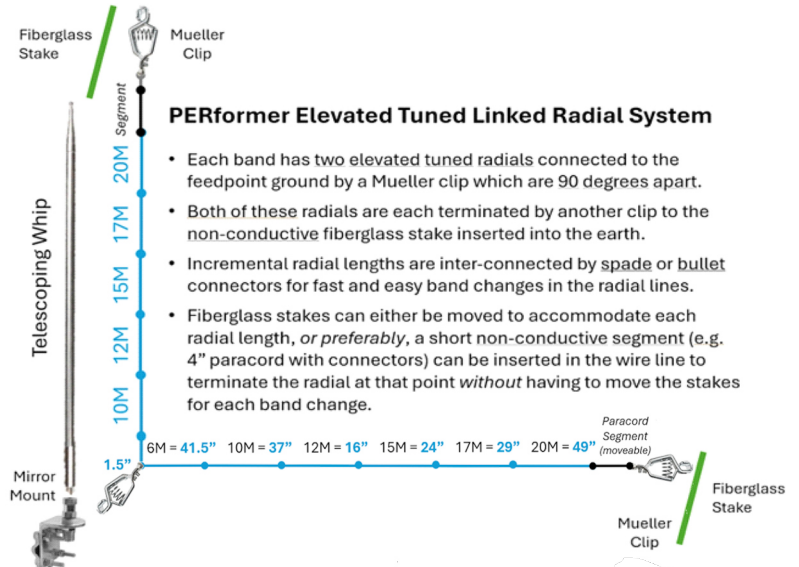
Elevated Tuned Linked Radial Implementation

When a short non-conductive paracord segment is inserted within each radial line at the appropriate point for the desired band of operation, the total length of each elevated radial is:

Band / Length	Description of Total Radial Length
6M = 43"	1.5" feedpoint clip + 41.5" 6M radial segment
10M = 80"	43" 6M radial length + 37" 10M radial segment
12M = 96"	80" 10M radial length + 16" 12M radial segment
15M = 120"	96" 12M radial length + 24" 15M radial segment
17M = 149"	120" 15M radial length + 29" 17M radial segment
20M = 198"	149" 17M radial length + 49" 20M radial segment

Incremental wire segment lengths for each band in the radial pair

To construct the linked radial system, cut a 6M pair with 41.5" of wire (considering the 1.5" Mueller™ clip = 43" total) and attach the Wirefy™



connectors. Next, cut pairs of incremental wire segments for each of the other five bands and attach connectors. I like Wirefy™ spade connectors because you tightly crimp the wire within the heat shrink tubing. Once heated, the tubing shrinks, and it also includes internal glue for a very secure fit.

Once all the incremental sections are cut, connect all the six band segments together in a single string to make a 198" 20M radial. Insert the non-conductive segment at the end and attach to a Mueller™ clip and female connector. Make sure the band segments are all connected in correct order: 6M, 10M, 12M, 15M, 17M and 20M. It is important to label each band segment. I use a Brother™ label folded over itself on each wire segment.

To change bands in the field, both the length of the telescoping whip and the two elevated radials must be adjusted. To adjust the radial lengths, there are two options:

1. Add or remove a radial wire segment for the desired band and relocate the fiberglass stakes to ensure the elevated radials remain taut. This requires the end stakes to be pulled out of the ground and moved to new positions for each band change (not ideal, but it works fine).
2. A faster and simpler way is to insert a non-conductive segment between the band wire

segments terminating the radial at that point for the desired band. I created this by cutting two 4" lengths of paracord that were thin enough to fit the Wirefy™ spade connectors. By doing so, the fiberglass stakes do not need to be relocated for each band change. When the antenna is initially deployed, extend the two elevated radials fully taut with all band wire segments. Once extended with the stakes, insert the two non-conductive segments after the band segment desired. For example, if you want 15M, insert the non-conductive segments between the 15M and 17M wire segments. For 20M, insert the non-conductive segments between the 20M wire segments and the endpoint Mueller clips. The antenna does not 'see' the radial line past the paracord.



Left: Non-conductive inserts

Backpack Portable Version

The PERformer has been a fantastic portable antenna system for my picnic table POTA activations, typically running QRP 100 watts.

However, a couple years ago, I purchased the ICOM IC-705 QRP transceiver with the ICOM backpack for ultra-portable operations. The IC-705 and backpack have been a great catalyst for me to explore more remote park sites and learn to fully appreciate the wonderful world of QRP 10 watts SSB.



Left: The A clear plastic toiletry bag holds a Chameleon™ 40M-COIL, as well as the linked radials. This bag, along with a RigExpert™ Stick and a BIBURY™ portable multitool, all easily fit in the front zippered compartment of the backpack.



To redesign the PERformer for more portability, I developed some modifications of the antenna system to facilitate a compact version that will easily fit in the side pocket of the ICOM backpack without sacrificing performance.

The side pocket easily carries two shortened 3' fiberglass end stakes for radial elevation, two narrower PVC tube halves with a coupler on one, the Chameleon™ 17' telescoping whip and ground spike. Depending on the ground conditions of the deployment site, the

WRC™ Megapod small tripod can be used instead of the ground spike. The antenna system remains very stable.

Additionally, I carry a [Comet™ Antenna SBB-2](#) black mobile antenna for 2M/70 cm band coverage on the IC-705. The Comet™ is a well-designed compact 18" dual-band antenna that operates as a quarterwave for 2M (+2.15 dBi) and a 5/8-wave antenna for 70 cm (+3.8 dBi). It can handle up to 60 watts.

The backpack side pocket easily holds the Chameleon™ 17' whip and ground spike. I also cut a 40" PVC tube (3/4" O.D.) in half and glued a coupler on one end. The two fiberglass end stakes are cut down to 3' long. I slide the Chameleon™ 17' whip in one half of the tube, and the ground spike in the other. I wrap a Velcro™ strap around the two halves with the two fiberglass end stakes to hold the items securely.

Comparing the PERformer with Radial Spans at 90° Directional and 180° Omnidirectional

Elevation off Horizon	90° Span (directional)	180° Span (omni)	Delta
+24° Forward	+0.31 dBi ✓	-0.67 dBi	+0.98 dB
+40° Regional	-0.31 dBi ✓	-2.67 dBi	+2.36 dB
+60° NVIS	-3.26 dBi ✓	-8.53 dBi	+5.27 dB
-24° Rear	-3.09 dBi	-0.67 dBi ✓	+2.42 dB

- Directional configuration provides **3.37 dB front-to-back** at 24° elevation
- Radial span does *not* impact antenna **radiation efficiency** of 90.4%

One of the interesting features of the PERformer is that the radials can provide some directionality at a 90° span but can also be made omnidirectional with a 180° span (opposite each other). This benefits those deployments where you want to radiate evenly in all directions (e.g., center of the country). Note in the 15M far field radiation graphic below, the radial span at 90° is in red and the span at 180° is in blue.

The 90° radial span provides +0.98 dB more forward gain at +24° elevation, +2.36 dB more angled gain at forward regional angles around +40° off the horizon, and +5.27 dB more upward

gain at forward NVIS angles beginning at +60° off the horizon. However, the 90° radial span creates a null at -60° for weaker rear regional and NVIS coverage but has a 3.37 dB front-to-back at -24° for some directionality.

Comparing the PERformer Quarterwave, Challenger Halfwave and Dominator Halfwave Antennas

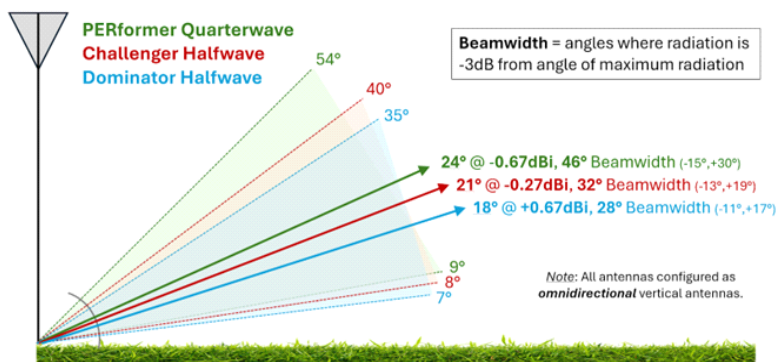
I designed three portable vertical antennas because each has their own best use case. The PERformer quarterwave is optimal for regional to continental coverage, the [Challenger](#) off center-fed halfwave is optimal for continental to global coverage, while the [Dominator](#) end-fed halfwave vertical is optimal for cross-continental and global DX coverage. All antennas provide high structural antenna efficiency and easy deployment.

The primary reach of these three antennas results from angle of peak radiation, strength of peak radiation, and the -3 dB radiation beamwidth. The graphic [right] demonstrates how unique each of the antennas are in these characteristics. The Challenger peak radiation of -0.27 dBi is at an angle 3° lower than the PERformer, while the Dominator peak radiation of +0.67 dBi is at an angle 3° lower than the Challenger! Among all three antennas, the Dominator has the most concentrated and narrowest -3 dB beamwidth of only 28° radiating at 18° above the horizon for fantastic DX when the conditions are right.

When looking at the far field omnidirectional radiation patterns of all three antennas overlayed, the Dominator provides the strongest radiation below 30° off the horizon, while the PERformer provides the strongest radiation between 30° and 60° off the horizon for fantastic regional coverage. The Challenger fits perfectly in between the other two antennas with the most balanced omnidirectional radiation.

When looking at the far field radiation patterns with the PERformer in its directional configuration, note how its radiation exceeds the Challenger at 16° off the horizon and ultimately exceeds the Dominator at 23° degrees off the horizon. This is what makes the directional PERformer so popular among portable POTA

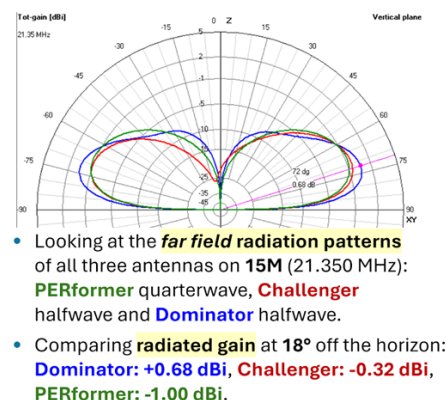
Specifications	PERformer	Challenger	Dominator
Vertical Wavelength	• Quarterwave	• Halfwave	• Halfwave
Antenna Configuration	• Omnidirectional • 2 Elevated Tuned Linked Radials 180° apart	• Omnidirectional • 1 Linked Counterpoise, ~10% λ per band	• Omnidirectional • 1 Linked Counterpoise, ~33% λ per band
Band Coverage	• 40M-6M	• 20M-6M	• 17M-10M
Structural Efficiency	• 90.8%	• 94.3%	• 99.5%
50Ω Impedance Match	• ---	• 4:1 Unun Off-Center Fed	• 49/56:1 Xformer End-Fed
Key Component Loss	• -0.12 dB (toroid choke only)	• -0.46 → -0.35 dB	• -1.08 → -0.51 dB
Peak Radiation	• -0.67 dBi	• -0.27 dBi	• +0.67 dBi
Angle of Peak Radiation (-3 dB BW)	• 24° (9° to 54°)	• 21° (8° to 40°)	• 18° (7° to 35°)
-3.00 dB Beamwidth	• 46° (-15°, +30°)	• 32° (-13°, +19°)	• 28° (-11°, +17°)
Primary Reach	• Regional, Continental	• Continental, Global	• Global



activators! As expected, in that directional configuration, both the omnidirectional Challenger and Dominator significantly exceed the PERformer radiation on the backside. As mentioned earlier, each antenna has its own best use case and is very effective based upon the communication objectives.

Final Comments

The PERformer is a very efficient quarterwave vertical antenna and I strongly encourage you to try your own implementation in the field. The elevated tuned linked radial system has performed extremely well. I am able to change bands by easily inserting the short non-conductive segment between the appropriate band wire segments and then adjusting the whip to resonance. Band changes take less than a minute.



As with my Challenger halfwave and Dominator halfwave vertical antennas, this antenna deploys very fast. I can get the PERformer up and running with the elevated radials in a couple minutes. And when it is time to leave, the antenna is fast and easy to take down and pack-up. For me, a key feature of a portable antenna is not only its performance, but the elegance of its design and deployment.

As I mentioned earlier, each of my vertical antennas has its own best use case. Depending upon the operational objective, I always have these antennas ready to deploy. You may want to consider building all three antennas and keeping them ready in your portable antenna portfolio.

The PERformer could also be used at your home QTH, especially in a neighborhood with antenna restrictions. Keep in mind, you will have to adjust the telescoping whip length and the set of tuned radials for the band you want to operate on. For an HOA or emergency communications,

the advantages of the PERformer are that it is fast and easy to deploy when you want to use it. Then you can take it down quickly until you want to operate again.

One of my favorite parts of HAM radio is experimentation - especially with portable antennas. Give it a try and have some fun! I design these antennas to encourage ham operators to homebrew their own antennas. You can do it!

Please let me know if you have any questions, I'd be happy to help, 73! 😊

~ Greg Mihran, KJ6ER
Campbell, California

www.grz.com/db/KJ6ER

[PERformer Video](#) and [Presentation](#)

gmihran@me.com (650) 714-7577

Dog Stake Mast Holder

An incredibly cheap and easy build is the Dog Stake Mast Holder. The dog stake is commonly available at Dollar Stores for less than \$5. All you need is a solid vise and about 6 minutes and you can fabricate yourself a snazzy mast holder.



Using the vise, you simply straighten out the handle and maintain the corkscrew as it is. I sharpened the bottom spike with a belt sander to make pushing it into the ground easier. I also put a little shrink wrap over the sharp end of the corkscrew that would normally go into the ground.

Hams have typically used a beach fishing rod holder but they are more expensive and less robust than this little build. It accommodates a telescoping fishing rod perfectly that you can use for a quick deploy mast for POTA or portable operating. The inside diameter of the corkscrew is 3.5cm/1.38" and fits a 3/4" pipe insulation piece perfectly if you want to snug up the fishing rod. And that's it! It's a very handy, quick and simple gear build.

73!

~ Jason VE5REV

Courtesy: [Moose Jaw Amateur Radio Club](#)

But, does it PERform?

by JOHN SCHOUTEN VE7TI

Well, I was curious about the PERformer so I decided to try it. You may recall that my favourite POTA antenna is the linked 5-band HF dipole as described in The Communicator [November-December 2023](#). A classic inverted 'V' dipole, it has been a tremendous performer for me, so I've not really considered replacements. My best sideband contact from the Vancouver area last spring was a 20 Watt POTA activation on 10m SSB and my Xiegu G90 with Namibia (near South Africa). But, despite my preference, my curiosity was enough for me to want to try the PERformer.

I ordered a 5m telescopic whip from AliExpress, C\$20, which arrived within 2 weeks. I've used whips before and they came with 3/8 x 24 thread. This whip had M10... never mentioned in the ad. I ordered an adapter C\$10, but, rather than wait another couple of weeks, I was anxious to get this antenna on the air. I drilled a bracket from my junk box and mounted it to some spare 3/4-inch PVC pipe along with a spare RF feedline choke. It was clamped to my POTA tripod and, with the two segmented radials assembled, I was ready to give it a backyard try with my analyzer.

As you can see from the photos [right], it all measured up great.

The next day it was time to see if I could actually make a QSO. The PERformer was set up in the back yard and the radials oriented to the southeast. I was using my Xiegu G90 with 20 Watts. After tuning the whip for 20m and finding that the maximum SWR across the phone portion of the band was 1.2:1. I spun the dial. The first station I heard was S51DX, Janez Celarc in Slovenia, not at all within my setup's orientation. He was booming in at S9+10! Try as I might, I could not break the pileup with 20 Watts. Unfortunately propagation was playing

games and 20m was up and down, but I made several other contacts across the United States.

The antenna obviously worked and I took it for my next POTA outing. Is it better than my linked dipole? It seems quieter. I intend to run a showdown with both antennas as a comparison. The PERformer is faster to set up but it must be tuned, either by taking the time to measure for each band, or via an analyzer. In comparison, the linked dipole is pre-tuned and just works, even without a tuner. Space-wise both antennas are similar.

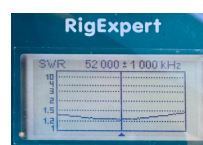
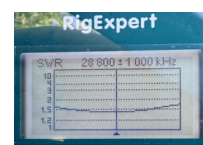
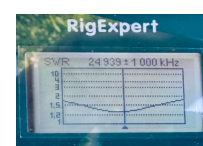
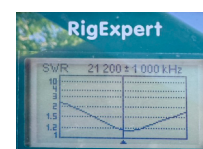
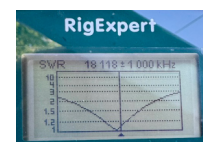
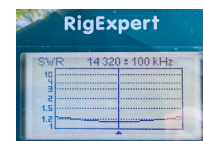
~ John VE7TI

When I told him about this article and my experience, Fred Orsetti VE7IO also built the PERformer. Fred works CW almost exclusively. He wrote that the setup went very smoothly with no surprises: "Changing bands was easy... I selected the radial disconnect point for the band and, using my old MFJ analyzer, I adjusted the whip, and it was done. The IC-7300 showed an absolute flat SWR with zero bars showing on the graph. Most of the time I ran 40 watts, but at the end I kicked it up to 70 watts without a noticeable change in rate. I operated mostly 20 meters but tested 15 and 17 for tuning and operating.

Directionality was interesting because I oriented the radials in an easterly direction but worked EU and Texas which suggested to me that it was quite a broad radiation pattern. I did not work JA's, thank goodness, or I would have been scratching my head.

POTA is always fun and relaxing but when the station performs it is just great. The antenna worked as expected and I have no modifications to suggest at this time.

Thanks for including me in this project, it did not break the bank and was fun to build."





Testing and modifying the “POTA PERformer” antenna

by JOHN CORBY VA3KOT

What is the POTA PERformer? Greg Mihran KJ6ER has introduced us to an antenna that he calls the “POTA PERformer”. The capitalized PER in its name is an abbreviation for “Portable, Elevated, Resonant”. But what is it really? The POTA PERformer is an adjustable elevated vertical radiating whip with two adjustable elevated radials. In concept there is nothing really new about it, but the unique implementation devised by KJ6ER is quite interesting.

Get up off the ground

Most hams will be aware that a quarter wave vertical antenna, mounted on the ground, requires an extensive system of radials to be efficient. I have successfully used such an arrangement with as little as four radials during a POTA activation out in the Big Blue Sky Shack. But, as they say, even a poor antenna will get you contacts when conditions are right. Some recommend as many as 120 radials although anything over 16 provides very little further improvement. In a portable situation laying out a lot of radials for a short-term temporary station doesn't make a lot of sense. So what is the alternative?

Less is more

If the base of the antenna is raised above the ground, fewer radials are needed to form an effective counterpoise and make the antenna efficient. How many? KJ6ER has settled on two radials for the POTA PERformer. If the radials are arranged at 90 degrees to each other the antenna has a directional radiating pattern. But using two radials increases the footprint on the ground and that



John Corby VA3KOT resides in Owen Sound, Ontario but is more often found operating CW out in the "Big Blue Sky Shack". He especially enjoys activating parks for the POTA program and blogging about his experiences at HamRadioOutsidetheBox.wordpress.com



could be an important consideration if, for example, we are operating on a narrow trail. Could we get away with just one radial? I modeled a POTA PERformer using EZNEC and came up with a comparison, shown in the following table.

Parameter	Single radial	Two orthogonal radials
Max radiation elevation (deg)	25	25
Gain (dBi)	1.34	1.19
Elevation beamwidth (deg)	55	47
Azimuth beamwidth (deg)	256	305
Front/Back (dB)	4.6	3.34

TABLE: 1 radial versus 2 radials



Tripod mounted whip at Ham Radio Outside the Box

Now I'll admit that I am no expert in computer modeling, but the results I obtained seem to differ from what KJ6ER found. In either case, whether two radials or just a single radial are used, we have a directional antenna that can be rapidly deployed in the field.

One radial or two? Now here's a surprise!

The original POTA PERformer is a multiband antenna. It covers all the bands from 20m up to 6m with a 17ft telescopic stainless steel whip and adjustable length radials. KJ6ER suggests extending the band coverage to 30m and 40m by means of a loading coil at the base of the whip and then... surprise... combining the two radials to create one long radial wire. I suspect the 30m/40m version may lack some of the gain and efficiency of the higher band version due to the losses involved in base loading a vertical radiator. Perhaps a full length vertical wire supported by a pole, or a tree, might be better.

NB August 29 update: After reading Greg KJ6ER's analysis in more detail I am now convinced that using 2 radials raises the antenna's efficiency.

I have always felt there is something incongruous about using a counterpoise that is longer than the radiator. Perhaps that concern is unfounded if we consider that a raised radial wire also radiates.

Customizing the original clever idea

I have tried the POTA PERformer with both a single radial and two radials. Both versions "worked" and I made contacts. It is difficult to interpret which was better, but my own preference - for field expediency - is a single radial. The 20m, 30m and 40m bands are my preferred haunts, only for the reason that two of my QRP radios do not support the higher bands. Even though the POTA PERformer is a great idea with very positive reports from several sources on YouTube and elsewhere, it doesn't fit well with how I like to operate. Here is why.

Please remain seated

A raised radial wire is a tuned counterpoise. Its length is important. That means band changes involve adjusting the length of the radial(s). One way of doing this is to insert a non-conducting link in the wire and move it between linked sections to set the conducting part of the counterpoise to the correct length for the band of operation. The overall length remains the same but the sections of the wire not being used are isolated from the rest of the antenna. Another way that I have tried is to use a metal measuring tape and unwind it to the correct length. Perhaps using multiple raised radials where each wire is adjusted for a different band would also work. Whatever method is used, getting out of your chair and fiddling with radials and whip lengths is a time consuming distraction. So what's the alternative; how can you stay in your seat and change bands?

Get on the ground and spread 'em!

Sacrificing a little efficiency is required but it can be done. My own method is to spread out four radial wires in a fan pattern on the ground, facing the direction I want my signal to go. Are four ground radials enough? If the vertical element is ground-mounted then using only four radials results in efficiency loss. But, if the whip is elevated? Who knows, but it works.



Since ground radials are detuned their length is not critical. No adjustment is required whether operating on 20m, 30m or 40m. The only requirement is that there is sufficient copper on the ground to provide a good counterpoise; I use 4x13ft radials. Orienting all the radials in one particular direction does improve the signal in that direction to a small extent. How much efficiency is lost? That is very hard to quantify but the convenience factor is high.

A 17ft whip with an adjustable loading coil (bypassed for 20m) will cover all three of the bands that I need. I have also used a 9ft "tactical" whip whose fixed length sections are held together with bungee cord. This shorter

whip uses a separate loading coil for each band and is usually only employed with my QROp rig (a 100 watt radio that is usually set to 20 watts or less). This radio gives the ability to transmit a little more power when needed.

"QRP when possible, QROp when needed"
- Ham Radio Outside the Box

Is there any real difference between 5 watts and 20 watts? Maybe not but it does give me a nice warm feeling - especially if I get too close to the antenna while keying up.

~ John VA3KOT

The Zenith Satellite Tracker

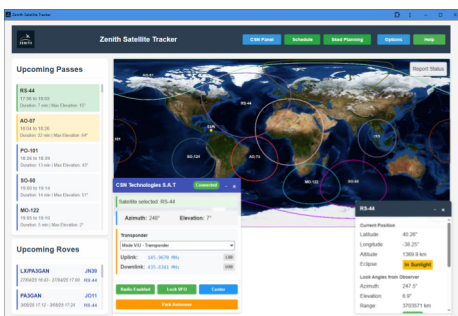
Yet another new software tool for satellite enthusiasts

Satellite aficionados have been blessed with two new tools in the past few months. Last issue I wrote about SkyRoof and this month it is the Zenith Satellite Tracker, accessible at <https://zenithtracker.org/>, a modern, web-based application tailored for amateur radio operators and satellite enthusiasts, offering a robust suite of tools for real-time satellite tracking, pass predictions, and radio hardware integration. Designed with user accessibility in mind, the free hosted version at web.zenithtracker.org allows users to start tracking satellites instantly without setup. Requiring only a visit to the site, configuration of location and satellite preferences via the "Options" button, it offers

exploration of an interactive map displaying real-time satellite positions and footprints. The application provides detailed pass predictions in local time zones, ensuring clarity for

scheduling contacts, and features a polar radar visualization for selected passes, enhancing planning precision. For advanced users, Zenith supports self-hosted deployments to enable seamless integration with professional radio hardware like CSN S.A.T and QTRigDoppler, though this functionality is unavailable in the free version due to local network requirements. The interface is intuitive, with a sidebar for upcoming passes and a main map for visualizing satellite paths, making it suitable for both beginners and seasoned operators. Licensed under the GNU Affero General Public License (AGPL) v3, Zenith is open-source, encouraging contributions while requiring modified versions to remain publicly accessible. Maintained primarily by a single developer, the project emphasizes community patience and adherence to contribution guidelines, ensuring sustainable development. Whether for casual satellite observation or sophisticated amateur radio operations, Zenith Satellite Tracker stands out as a versatile, user-friendly platform.

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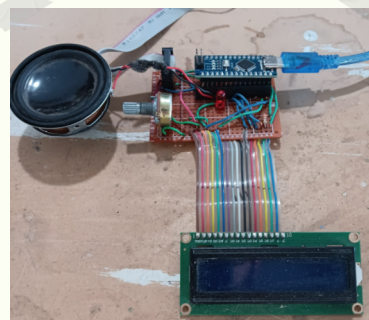
Another Simple Morse Code Trainer

It uses only 7 parts

After the author failed to find a Morse code trainer that teaches in a way he can learn it, he decided to make one that works for meh. This uses an older PS/2 keyboard, Arduino Nano and various output devices. A speaker to hear, an LED to see flashes and a LCD screen to display the code as well as the answers.

The Arduino picks a random letter (no numbers yet), and displays the dots and dashes on the LCD screen, an LED and a speaker. The timing of the entire Morse code character is set to take less than one second to output. Then the user has one second to input the correct (or wrong) answer using the keyboard. The LCD displays either the correct or wrong result.

Since he grew up using a keyboard, he found it more natural to type and correlate the keys to the tones. There has already been an increase in responses to tones and correct answers.



This project still a work in progress but is a simple introduction to Arduino.

<https://hackaday.io/project/203560-1-hertz-morse-code-game>

<https://youtu.be/0-GG9E8Ox2M>

~



Action Radio Ham

Talk about taking your hobbies to the next level—this guy's DXpedition is so serious, even his action figure has a better radio setup than most real hams. With "gripping hands," a t-shirt for every occasion, and a beard to confirm his masculinity—he's ready to broadcast from the tropics, the living room, or wherever portable antenna placement is required!

Comprehensive Index to Communicator Articles

Thanks to Blake VA7BWG and Reg VA7ZEB, a database index of Communicator articles back to 2007 is available at [Surrey Radio - Search the Archive](#).



High Altitude RF Adventures

by PAUL SIGNORELLI W0RW

This article is from my observations and experiences of High Altitude Radio operations in Colorado.

The effects of high altitude sickness is more full described at: https://en.wikipedia.org/wiki/Altitude_sickness. It includes headache, confusion, fatigue, stomach illness, and dizziness

I get a little light headed at altitude (I am over 80 years old) and when some big winds came up on a recent hike they buffeted me around and I got a little dizzy until they stopped. (That is a sign of altitude sickness). The effects of headache, confusion, dizziness that I have seen resulted in the inability to operate the software and menus of newer radios. Confusion remembering schedule times and dates, recording call signs and data in a log book, leaving antenna parts, wires and tools behind on a hike. One effect I saw was a fisherman who

locked his keys in his car at 11,000 feet being 100 miles away from help. One SOTA friend hoisted his SOTA Flag upside down at 12,000 feet.

Dizziness during walking can lead to having unstable footing and a fall. Fatigue is one of the easiest ways to recognize sickness. This is determined by your fitness and heart condition (Blood Pressure). The fatigue feeling can be like having 'Cement Boots' on while walking. It may come on you slowly after a few hours at altitude. The other effect is called 'Hitting the Wall', Your body just stops working.

One of my comrades came from sea level and had several fatigue incidents. One time after riding the COG Railroad to 14,000 feet (Pikes Peak), He got off the train and made it 100 feet across the top of the mountain and had to sit down for 10 minutes to recover. (Walmart now sells small canisters of oxygen for hikers).



The other incident occurred while we were climbing to Devils Head Fire Tower at 9,700 feet (<https://dayhikesneardenver.com/devils-head-fire-tower-lookout-hike/>). He did well going up the 800 foot climb but 'Hit the Wall' going up the last 100 feet of Fire Tower stairs. He was stopped in his tracks. I recognized the effect and he said his body just could not move any more. He quickly recovered.

Another friend set up a tower at 14,000 feet for a contest. High winds came in and blew the tower over. He and his friends had only attached 2 guy wires to the tower. That was muddled thinking. The best way to recover is to descend to a lower altitude.

If you are visiting the Colorado area, One good way to check your ability to operate at altitude is to climb the Manitou Incline in Manitou Springs, Colorado. If you can make the climb without observing any altitude sickness you can probably successfully climb the 14ers. It is 2744 steps with an altitude gain of 2020 feet. See <https://manitousprings.org/where-to-play/manitou-incline/>.

Not everyone experiences altitude sickness, Younger people don't seem to succumb to it. The Pikes Peak concession workers go up there every day and never have any problems.

Weather Conditions at Altitude

The obvious danger in High Altitude Operations is the weather. Almost all hikers start in the early morning to avoid the afternoon thunder storms. The remedy for bad weather is to move to lower elevations slowly (recalling that high elevations cause dizziness and poor footing). Getting back down below tree line is important.

On one early morning hike in Rocky Mountain National Park (Marmot Point) at 12,000 feet, (<https://www.summitpost.org/marmot-point/384006>), I heard a little precipitation static in my headphones (Crackle - Crackle) and a snow squall was blowing through. The snow was just like little ice flakes hitting me in the face, not wet snow. There was no lightning or thunder in the area. Then I felt a few prickly zaps in my shoes and off my handset. Those were electro-static discharges !

I quickly got off the ridge line and took the radio off my back and removed the whip until the snow squall blew by. When I put the whip back on the radio, the

antenna tuner would not tune the whip. The precipitation static had blown my antenna tuner up. Later in the shop, I checked all the parts that might have been damaged but found no defects. The static had upset the tuners' microprocessor software.

This tuner even has a Victoreen (type) gas discharge tube (Like a NE-2) across the antenna terminal but that did not save the microprocessor software. I was using my PRC319 Military Backpack Radio. The radio was not damaged but the expensive tuner was never able to be fixed. Now, whenever I am operating at altitude, I use a shorted ¼ wave coax stub as a drag wire counterpoise.

Here is a cool cartoon link about what P-Static sounds like. <https://tinyurl.com/yvb37yh2>.

There are benefits to high altitude operations; There are not many snakes above 9,000 feet and mosquitoes have a little difficulty living at altitude. If you can get above Tree Line there are no trees to snag your whip.

If you spend a lot of time or camp at altitude you might notice the lack of humidity and subsequent drying of your nasal passages. You need to drink lots of water or use an altitude mask. <https://cobaltdesign.co/work/humidifyer-mask/>

~ Paul W0RW





The Truth About VHF SOTA

by BOB WITTE K0NR



Bob Witte K0NR
has a great blog
site at [https://
www.k0nr.com/
wordpress/](https://www.k0nr.com/wordpress/)

Bob is author of
VHF, Summits
and More



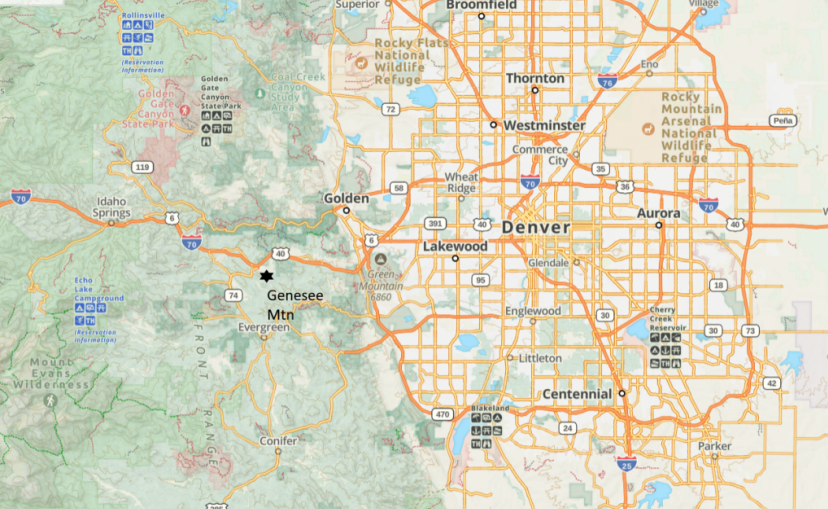
I've been having fun with mountaintop VHF ham radio for decades, way before Summits On The Air (SOTA) was a thing. It is an activity that I enjoy very much during VHF contests, Parks On The Air (POTA) activations, SOTA activations, and just goofing around in the mountains. Most of this activity has been on the 2-meter band, but any frequency above 50 MHz can be fun.

My philosophy with ham radio is to have fun doing ham radio things and tell people about it. If they think VHF SOTA looks like fun, other hams may try it. At the same time, I want to be open about the challenges that may be encountered. Doing SOTA activations using just VHF can be difficult, even frustrating. (This is one of the reasons I like doing it.) So this post is a cautionary tale, focused on three essential principles.

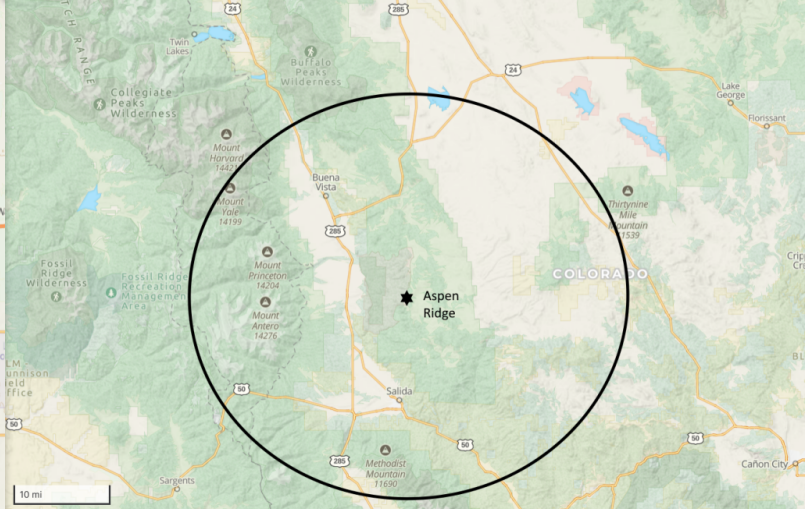
1. VHF SOTA is easy to do, except when it's not

A VHF SOTA activation can be as simple as taking a \$30 handheld radio on a hike up a summit and making a few contacts on 146.52 MHz or another simplex frequency. The radio is compact, lightweight, and completely self-contained, ready to go! This is arguably the easiest way to do a SOTA activation if the summit is near a populated area. For example, Genesee Mountain (W0C/FR-194) at 8284 feet overlooks the greater Denver area, so hike to that summit and you should have plenty of stations to work on 2m FM.

Now, try that same approach in a more rural part of the state and you may run into trouble. This is when VHF SOTA is challenging and potentially frustrating.



Genesee Mountain overlooks the greater Denver area.



Aspen Ridge (WOC/SP-084) is an example of a nice summit that is not near a large population of radio amateurs.

Which leads us to the second important principle...

2. You need to have chasers within range to contact

This is obvious, but you do need stations that are within range to work. This becomes more difficult in areas that have low population density. There may not be many radio hams within range of your chosen summit; they may not have 2m FM gear, they may not be listening to your frequency, and they may not even have the radio turned on.

Before activating a summit, consider the likely range and how many chasers might be around for you to contact. Take, for example, Aspen Ridge (WOC/SP-084) on the west side of South Park. The hike up is easy, and the elevation is substantial at 10,740 feet. The map shown above has a circle with a radius of ~25 miles, which is a conservative rule of thumb to get us started. Making radio contacts within this radius should be a slam dunk from this elevation, but it does depend on the actual terrain.

From the map, we can see that we should be able to work stations in Buena Vista and Salida, which are small mountain towns with a corresponding small ham radio population. Some of these folks make it a habit to monitor 146.52 MHz to see what activity occurs on the calling frequency, which helps. But it helps to get the word out to the target audience that you will be on the air. The basic idea is to “send invitations” for your planned activation. The local radio club (Chaffee Lake Amateur Radio Association) has a groups.io list, so you could drop an email

message there. If you know some of the hams in the area, you can always reach out and ask them to be listening for you. It is always good to post an ALERT and then a SPOT on SOTAwatch because some chasers may see that. Also, keep an eye on SOTAwatch for other SOTA activators that are on other summits. Another trick is to get on a local repeater and see if anyone is around that can move over to simplex for a SOTA contact. During the summer months, it is common to encounter tourists, campers, hikers, or off-road enthusiasts on 2m simplex.

Looking at my Aspen Ridge logs, I see that I’ve worked KOMGL at his home station near Florissant, at about 60 miles, with some mountains in the way. So the 25-mile radius shown on the map is quite conservative. (Much longer distances are possible.) Now, I probably would not be able to work KOMGL with just a handheld radio and a rubber duck antenna.

Which leads us to our third and final principle...

3. Every decibel of signal strength matters

VHF radio often gets described as being limited to “line of sight,” which is a helpful model but one that is incomplete. (See The Myth of VHF Line of Sight.) I often make VHF contacts beyond line of sight, bouncing signals around the mountains without knowing the actual radio path. These VHF SOTA contacts happen at the fringes of radio coverage. That is, there is just enough signal to complete a contact, but small changes in signal strength can make the difference between success and failure. So you should optimize your station as best you can.

First up is ditch the rubber duck antenna and get an antenna that is a half-wave in length on the 2-meter band. See A Better Antenna for Dualband Handhelds. Make sure it is a half-wave and not just one of those extended rubber duck antennas that are a quarter-wave. Those work a little better than the typical rubber duck, but the half-wave is far superior.

Another half-wave option is the roll-up J-pole antenna, such as the N9TAX Slim Jim antenna. (There is a slight difference in construction between a J-pole and a Slim Jim antenna but they are so similar, I consider them the same.) You can purchase this type of antenna already assembled, but it also makes for a fun project to build one from scratch. (Just search on the web for "2 meter j-pole antenna plan.") You'll need some way to support this antenna, such as a non-conductive pole or a rope strung from a tree.

The next step up in antenna performance is to add additional gain and directivity. I use the Arrow II 2m Yagi antenna, which provides about 6 dB of gain over a half-wave radiator. I normally just hold this antenna in my hand, but you can also set up a mast to support it.

Another option is to increase your power level. The typical HT puts out about 5 watts but a mobile radio can go up to 50 watts, a 10-dB improvement. While antenna improvements help on both transmit and receive, increased transmitter power only makes your transmitted signal stronger. However, if the other station is also running 50 watts in a vehicle or at home, more power from the summit tends to balance things out.

The key point here is that even a few decibels of improvement can yield more radio contacts.

Wrap It Up

So there we have it, three important principles to keep in mind when pursuing SOTA activations using VHF. I have had a ton of fun doing this, but I also know it can be frustrating. The most fun occurs when I make a long-distance contact that I did not expect. (My best DX from a SOTA summit using 2m FM is 245 miles.) Keeping these principles in mind helps to set expectations while providing some ideas for improving your odds of success.

73

~ Bob KØNR



Social Reminder

The Saturday weekly social gathering is once again 'on' at the Denny's Restaurant, 6850 King George Blvd., Surrey BC from 07:30—09:30. All are invited. Afterwards, we will host workshops and will be available to invigilate Amateur Radio exams at the OTC, 5756—142 Street, Surrey from 10-noon.

Bring your ham issues, our Elmers will try to help you sort them out.

Hamshack Hotline Orphans

You're invited to apply for services at Hams Over IP

by GESCIO O. ALPURO WH6AV



In response to recent service changes and anticipated outages affecting Hamshack Hotline (HH) users, Hams Over IP Inc. is extending a warm invitation to all amateur radio operators affected by the transition to apply for service on the Hams Over IP (HoIP) network.

As a volunteer-driven nonprofit platform, Hams Over IP was founded by hams for hams, with a mission to offer a reliable, secure, and modern VoIP network exclusively for licensed amateur radio operators worldwide. With robust infrastructure, active development, and a welcoming community, HoIP is proud to support the continued growth of digital amateur communications.

As Hamshack Hotline service winds down for many, Hams Over IP stands ready to welcome operators who want to continue enjoying seamless radio-over-IP connections.

Why Choose Hams Over IP?

- Reliable service and infrastructure
- Active peer and extension network
- Secure registration with callsign verification
- Wide device compatibility (Cisco, Grandstream, softphones, and more)
- Friendly technical support and community forums

How to Apply

Interested hams can apply for service at:

<https://www.hamsoverip.com>

The application process is simple and designed to verify callsign validity while providing setup guidance for a smooth onboarding experience.

About Hams Over IP

Hams Over IP Inc. is a nonprofit organization committed to supporting and expanding amateur radio VoIP technologies. Built by licensed amateur operators, HoIP maintains a secure and dynamic network that connects hams through modern IP-based voice services with servers powered by VULTR located in multiple countries that are designed to provide low-latency and optimized performance for users worldwide.

For more information, please visit:

<https://www.hamsoverip.com>

~ Gescio O Alpuro WH6AV
Hams Over IP Inc.

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Hams Over IP

Zero Retries



The Linux Handie Talkie

and why In person conferences are (still) important

by STEVE STROH N8GNJ



Steve Stroh N8GNJ is the Editor of the Zero Retries newsletter (<https://www.zeroretires.org>) which promotes technological innovation that is occurring in Amateur Radio, and Amateur Radio as (literally) a license to experiment with and learn about radio technology.

When not writing Zero Retries, Steve experiments with Amateur Radio data radio systems in N8GNJ Labs (his shop) in Bellingham, WA, and planning for the first Zero Retries Digital Conference in Everett, WA in September, 2025.

There's a very exciting development in the making - the Linux Handie Talkie (LinHT), and why in-person technical conferences still have an important role in Amateur Radio

Disruptive Technologies

One theme that I regularly revisit in my Zero Retries Newsletter is disruptive technologies. This idea was popularized and explained by author Clayton Christensen in his seminal book *The Innovator's Dilemma*. Christensen explained that seemingly small, mundane new technologies can safely be ignored; innovations are often known and understood by big, dominant companies, but aren't taken seriously as a business threat - until such developments "grow from below" to threaten those big companies. An example is that Kodak actually invented digital photography as we now know and use it, but they chose not to develop digital photography because they had a very profitable film and photo processing business.

One example of disruptive technology that I'm following in Zero Retries is the rise of the M17 Project which is a "clean sheet of paper" Digital Voice system for VHF / UHF. M17 is disruptive technology because it's entirely Open Source. Thus M17 can be adapted, forked, implemented in new systems, or "transmogrified" in any number of ways because it's open source. M17 has been implemented in a large number of different devices by individuals and groups because it has a detailed specification that has been tested by independently developed implementations all being proven interoperable. Although there are other Open Source Digital Voice systems and projects, to date M17 is the only such project that has achieved any scale, including a portable radio - the CS7000 M17 (and M17 GPS and M17 PLUS) by Connect Systems where M17 works "out of the box".



One project I was involved with is a new data communications system called IP400 that envisioned adding M17 capability as “just another mode” that was supported by IP400. IP400 “packets” would be received, encapsulated into IP400 packets, transported through an IP400 network, and then un-encapsulated at the destination. That flexibility to incorporate a voice mode was only possible because M17’s specification was so detailed and proven.

Linux Handie Talkie - LinHT

I cite M17 mostly as an example of an existing disruptive technology in Amateur Radio to set the stage for introducing the most disruptive technology I’ve seen to date - the Linux Handie Talkie - LinHT. LinHT is a project of the M17 Project and supported by the M17 Foundation. In a phrase, the LinHT is a Software Defined Transceiver in the form factor of a portable handheld radio. And, being Software Defined, nearly any type of radio technology can be implemented in the LinHT, as long as such technologies are within the technical capabilities of the LinHT’s hardware including operating within the Amateur Radio 70cm band (420-450 MHz) and the compute resources present on the device.

Continuing the disruptive technology theme with the LinHT, a LinHT is not something that is... or could... be a product of the big Amateur Radio manufacturers because such a product would quickly undermine their lucrative (for Amateur Radio) product lines. Examples are Icom being the primary manufacturer of radios that incorporate D-Star Digital Voice (and, commercially NXDN Digital Voice), and Yaesu being the primary manufacturer of radios that incorporate System Fusion Digital Voice. D-Star, and NXDN, and System Fusion... and DMR, and P25, and POCSAG, and Packet Radio, and (any other mode that can be implemented in a typical 25, or 12.5, or 6.25 kHz VHF / UHF channel).

What advantage does Icom have when D-Star is just another mode selection on a radio? Ditto Kenwood when 9600 bps AX.25 APRS is just another mode selection? Or Yaesu when SF is just another mode selection? Thus those

manufacturers are not only not motivated to create their own version of a LinHT... they’re actively disincentivized to do so... until they have no choice because the competition from other manufacturers is so intense that they have no choice.

The reason that LinHT is such a disruptive technology is that there are a number of factors that uniquely converged in mid-2025 including:

- Need - Amateur Radio Operators are getting, really needing, separate radios for DMR, D-Star, System Fusion, data, etc. More importantly, we’re getting tired of not being able to communicate with those who choose a different DV technology. Yes, the Multi Mode Digital Voice Modem (MMDVM) units do allow some interoperability between DV modes, and there may be an option soon for “transcoding” between modes, but MMDVM will remain an “external” solution to “mode splintering” that is more easily addressed by the user’s (one) radio being able to change modes as needed to communicate with others.
- Technical Capability - In 2025, we finally have hardware that is low (electrical) power, inexpensive, but capable of doing Software Defined Radio. A decade ago, such technical capability didn’t exist (it was attempted, and that project failed).
- Amateur Radio Technical Maturity - GNU Radio is a software framework for Software Defined Radio hardware. GNU Radio on SDR functions much like Linux does for a variety of computer hardware (anything from ARM-based Raspberry Pis, to X86-based big PCs). That is, if an application is written for Linux (GNU Radio), it can be used on any hardware that Linux (GNU Radio) has been ported onto. Thus Amateur Radio experimenters can “easily” write new radio technologies in GNU Radio and run it on Software Defined Radios, which will soon include the LinHT.
- A Plan for Achieving Scale - An elegant idea on how to get LinHT to be easily manufactured. The LinHT project chose a popular, capable, but reasonably priced portable handheld radio as the “host” for the LinHT. The LinHT team implemented the LinHT on a printed circuit board that is electrically and mechanically compatible



with the portable handheld radio. Thus the LinHT team didn't have to create all those other support technologies - battery, case, screen, keyboard, accessories like speaker / microphones, etc.

- Open Source - The LinHT team's willingness to forgo the potential of profit and release all the elements of LinHT as Open Source means that anyone (and especially, any company) can incorporate the technology of the LinHT in their product lines. This is a win for Amateur Radio, since each manufacturer's LinHT will operate pretty much the same, so that radio technologies developed for LinHT will work the same.

The LinHT concept is now being proven out and in very active development. The hardware works, and early versions of some radio systems running on LinHT have been tested (and work!) LinHT development isn't done (and really, will never be done, any more than Linux could ever be considered "done" because it will remain endlessly expandable. But the concept of LinHT has been proven out at this point, and what remains is development, refinement, and implementation of new systems.

One of the most exciting elements of LinHT is that it's running GNU Radio on the device. That's the most disruptive element of the LinHT. Typically you do development of a new idea for radio technology running GNU Radio on a general purpose computer. You can develop it and then test it (in a simulation) on the general purpose computer. Then you might run your new radio (software) on an (expensive) Software Defined Transceiver (hardware) to really test it out with real over the air radio transmission and reception. Then, having proven out the concept, the typical process is to implement your new system on dedicated (less expensive, more practical) radio hardware.

But LinHT changes that calculus... Once you get your new radio technology working on the general purpose computer / simulation... you just load it onto the LinHT and run it.

And if you think that "I'm not smart / experienced / savvy enough to work in GNU Radio"... you don't have to be to use software (radio systems) developed for GNU Radio. Just load the software (developed by someone else) onto your LinHT and use it. This is much the same way as Linux applications have been developed for Raspberry Pi computers. You don't need to know (much) Linux to use Linux apps on a Raspberry Pi that you're using as an appliance, for example, AllStarLink. All you have to know is the minimal knowledge of how to download an image file onto an SD card that you then insert into the Raspberry Pi. That's very similar to how things will work with a LinHT - download a new image for the LinHT and begin using the application you just downloaded.



This combination of factors is why I think we will see a very rapid adoption of LinHT by a few radio manufacturers, especially the "not the big names" manufacturers in China. Here is a potentially very large market that's just in the very early stages, and the Non Recurring Engineering is very minimal - just create a LinHT printed circuit board adapted for your particular portable radio. Even the software (and support) can be very minimal and simple. The manufacturer can create a very simple image for their unit that, as an example, only has two "simple to implement" modes - FM and DMR. They can then test their unit with their existing validation suites for FM and DMR, test each unit, and offer factory support only for those two modes. All the other exotic modes that a LinHT is ultimately capable of can be handed off to the end user and the LinHT community.

I stated earlier Icom, Kenwood, and Yaesu have reasons not to create their own versions of LinHT because LinHT threatens their "franchise" radios - D-Star, SF, etc. But if they could overcome this bias against disrupting their franchises, I'll guess that they would find plenty of buyers for a Kenwood LinHT, or a Yaesu LinHT, or a Icom LinHT. On portable radios, the profit isn't (much) in the unit itself, it's in all the accessories -



batteries, speaker microphones, etc. But that opportunity to remain dominant manufacturers in the Amateur Radio market will be fleeting. The China-based radio manufacturers don't have franchises to protect, so I expect that they will quickly recognize, and move on the opportunity for an entirely new market that the LinHT represents.

But... ultimately... the most exciting element of the LinHT isn't the hardware, or the software, or the technology. The most exciting element of the LinHT is the potential to grow Amateur Radio! There are a lot of individuals that are familiar with GNU Radio, quite possibly every university Electrical Engineering student at least in the past five years, likely longer than that. GNU Radio and inexpensive (and minimally capable) Software Defined Radio hardware is the most flexible and inexpensive (and relatively future proof) method to teach the basics of radio technology to EE students. Want to demonstrate the basics of broadcast AM technology? Load that software. Want to teach the basics of Orthogonal Frequency Division Multiplexing (OFDM) that's the primary technology behind mobile networks? Load that software.

So there are lot of radio technologists out there familiar / comfortable with SDR and GNU Radio. With the advent of the LinHT as a usable, inexpensive way to run SDR... they would probably want to do such experiments on the air, build a group / network, and try out their ideas.

And the only real cost to do so, besides the LinHT unit, is obtaining a Technician (US) or Basic Qualification (Canada) Amateur Radio license.

The challenge for Amateur Radio is to figure out how to be ready for these "NewTechHams" (as I've coined a term in Zero Retries) if / when they come flooding in with their new LinHTs in hand.

To follow along on the development of the LinHT, see:

Zero Retries Newsletter - <https://www.zeroretires.org>

M17 Project - <https://m17project.org>

Why In-Person Technical Conferences Are (Still) Important

My wife Tina Stroh KD7WSF and I are the Conference Manager and Director, respectively of the new Zero Retries Digital Conference (ZRDC) which will be held on September 13, 2025 in Everett Washington USA. For details, see <https://www.zeroretires.org/p/conference>.

One motivation for creating ZRDC is that several great Amateur Radio conferences in the Seattle area were discontinued, notably the MicroHAMS Digital Conference (MHDC) and Communications Academy (CA). The two highest attendance TAPR Digital Communications Conferences were held in the Seattle area (and organized by Tina). To create the ZRDC in 2025 was caused by the (unhappy) discontinuation of the TAPR DCC, and the (happy) decision that the GNU Radio Conference (GRCon) 2025 would be held in Everett Washington USA. Everett is only 113 km (70 miles) from our home in Bellingham Washington USA. GRCon being an entire week

Zero Retries Digital Conference

September 13, 2025

Everett, Washington

If you're interested in topics such as IP400 Network Project (discussed in my last column), data repeaters (discussed above) or many of the widely varied "Advanced Amateur Radio" topics I discuss in my newsletter Zero Retries, then you'll probably enjoy attending the inaugural Zero Retries Digital Conference (ZRDC) which will be held on Saturday September 13, 2025 in Everett, Washington.

For more details, see

<https://www.zeroretires.org/p/conference>.

[Zero Retries Digital Conference 2025 Flyer](#)



about Software Defined Radio technology caused me to reflexively offer to volunteer to assist GRCon, and especially Tina who is very organized and administratively capable. (Zero Retries as a “nano business” would be impossible without her skills.) When we saw the very nice venue where GRCon 2025 would be held (the Edward D. Hansen Conference Center), Tina and I looked at each other and decided that it was time to act on our idea of an Amateur Radio technical conference as an outgrowth of the growing mission of Zero Retries to encourage technological innovation in Amateur Radio and “speak to” the growing population of “NewTechHams”.

But we’ve been asked... and borderline criticized... why do a day-long in-person conference? Why not an online conference like TAPR did, and the QSO Today Virtual Ham Expo? Or just do a few presentations at an existing event like Hamvention or SEA-PAC or Pacificon? And isn’t the idea of a dedicated conference (even online) obsolete in the era of “anyone can do a YouTube channel”, open source methodology (see everything, experiment at will), and continuous communication channels such as email lists and text chatting systems such as Discord?

My answer is the all of those virtual methods to interact are viable and valuable methods of information exchange. ZRDC will be live-streamed to virtual attendees, and soon after it concludes, be uploaded to YouTube and Digital Library of Amateur Radio & Communications (DLARC) for posterity.

But there is something... that’s very hard to quantify in text... that’s unique and special and highly productive about gathering together in person to exchange information about highly technical subjects. I’ve been the beneficiary of such in-person conferences for my entire Amateur Radio career, and that’s much, if not most, of the background I draw upon in creating and continuing to produce Zero Retries weekly for more than four years. I was a voracious reader of everything I could get my hands on about data communications in Amateur Radio - newsletters, magazines, books, etc. But the most valuable and memorable and intensive knowledge I received was from attending in-person events such as

DCCs, MHDCs, and CAs. The “just one of many” presentations that were Zero Retries Interesting offered at general Amateur Radio conferences such as Hamvention, SEA-PAC, and Pacificon were useful and informative, but because they were intended for a general audience, they couldn’t be as information intensive as dedicated conferences such as DCCs, etc.

It’s incredibly powerful to be able to interact with someone with deep knowledge of a subject that you’d like to know more about... and can just walk up to them and ask your questions. Believe me, such interactions make a huge impression. I can recall such exchanges with clarity, decades later.

Thus at this inflection point in Amateur Radio’s evolution - as Amateur Radio’s fundamental technology is about to shift into Software Defined Radio in the same way all electronics shifted into digital, and is now based entirely on microprocessors and microcontrollers (and, of course, software)...

I think that in-person technical conferences are more important than ever.

Those of us who will be in-person at ZRDC 2025 (and GRCon 2025) will have a very intensive, exciting, and (not to be too hyperbolic) mind-blowing experience. I am sure we will be discussing the LinHT, and the implications for Amateur Radio... and the incredibly cool things that LinHT makes possible, at ZRDC 2025 and GRCon 2025 (where I will be doing a Lightning Talk to evangelize the LinHT to the GRCon 2025 attendees).

This is one of those rare moments where you can see at least a hazy outline of the future... and know that in retrospect, ZRDC 2025 and GRCon 2025 were inflection points... and we were there!

Note: I do not receive any compensation for the products or projects mentioned in this article, other than I am Editor of Zero Retries, and ZRDC 2025 is a “product” of Zero Retries.

~ Steve Stroh N8GNJ
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This QRPp Fishing Lure

Helped me snatch a big one working my grey line

by JIM WILLIAMS Jr. N4JAW

HAM ON A BIKE N4JAW



Renowned Golfer Jack Nicklaus made this quote about fishing. "There are always places to go fishing. For any fisherman there's always a new place, a new horizon".

I equate that quote to my portable Amateur Radio activities. There are always places to go operate Ham Radio. There are always NEW Parks on the Air, Summits on the Air, Islands on the Air and other places to operate portable and another day or opportunity to make a QSO.

During my daily Early Bird Parks on the Air activation on August 13, 2025, I decided to operate QRPp (less than 1 Watt) with my QRP Labs QCX 40 Meter Mini with a 9 Volt / 200 mAH battery. Due to the excessive heat in the Ohio River Valley in Kentucky, U.S.; I try to get out around dawn to "Beat the Heat" and recently take advantage of the morning greyline over my QTH.

I don't operate QRPp often but I looked back at my previous QRPp operating and found I seem to do this when HF band conditions are questionable. I've come to understand that if I can make contacts under adverse HF band conditions, I can most likely make contacts under favorable conditions. Today's conditions were "Unsettled".

My morning started throwing a line up 25 feet to raise the center of my linked EFHW with one end 8 feet out the ground and other end at one foot above ground with 15 feet of coax to my seat.

Within 3 minutes I had my first QRPp QSO for the day with W8JWL / John from Michigan (325 Miles) followed by KU8T / Tom in Indiana (230 Miles), W4ZF / Mark in Georgia (360 miles) and then the BIG ONE from VK5LA / Andy in

Australia. It is the 2nd QSO in a week with Andy. First time I was using my FT-891 with 35 watts into a 29'6" Random Wire. Can't describe the excitement I felt with this QSO. It is the third time in a week my morning greyline has yielded DX into the Pacific region. In the last week I also worked JH1GEX / Komatsu in Japan on 20 meter SSB.

I continued to operate QRPp until I had 10 contacts when I switched over to 5 watts. The Reverse Beacon Network (RBN) picked up my signal mostly north of the Mason -Dixon line in the U.S. with one exception near San Diego, CA. which is likely the path of my signal took into Down Under.

All toll I had 19 contacts including the catch of a LIFETIME using QRPp for power along with the help of morning greyline propagation conditions into Australia.

QRP and QRPp operating reminds me of what my Radio Broadcasting mentor told me what I first became a D.J. "You never know who is listening when you opening that mic." I've heard the catchphrase, "Life is too short for QRP". I happen to operate differently. I LOVE A CHALLENGE. I love the thrill of using a different bait, a different lure, a different rod, a different weight of fishing line or a different reel. It could be that inexpensive toy rod and reel for a 5-year old to use to pull in that Bluegill or that expensive rod and reel to tackle that 200 lb Marlin.

[Come along for "My Catch of a Lifetime Operating QRPp".](#)

~ Jim N4JAW

Catch this and Jim's other POTA adventures at:
<https://hamonabike.blogspot.com/>

Jim Williams Jr. N4JAW
Since going car-free several years ago, 99% of my POTA activations are done by bicycle. I call myself "Ham on a Bike" and as a bike tourist it is nothing for me to load up my bike for a trip which includes ham radio to add to the adventure.

<https://www.grz.com/db/N4JAW>



KB6NU'S HAM RADIO

A POTA procedural proposal

A proposed method to do a joint CW activation

by DAN ROMANCHIK KB6NU



Dan Romanchik

KB6NU blogs about amateur radio at KB6NU.com when he's not trying to figure out which way current flows. Dan teaches ham radio classes, and operates CW on the HF bands. Look for him on 30m, 40m, and 80m. You can email him at cwgeek@kb6nu.com

I often do POTA activations with two friends: Paul, KW1L and Rick, K8BMA. We almost always operate CW. On a recent activation, Paul asked if there was a way to do a joint activation like many phone operators do. If you hunt phone POTA activators, they often say something like, "Stand by for a second operator," then the second operator gets on and makes their contact.

This rarely happens on CW. In fact, I don't think that there's a standard procedure for doing this, and sending something like "QRX for a second operator" probably wouldn't work. For one thing, it's too long to send. For another, many POTA CW ops are not very experienced and probably wouldn't know what QRX means.

Even so, Paul and I wanted to be able to set up one station and then make contacts jointly. Paul emailed Tom, K4SWL, if he had any suggestions. Tom wrote back, suggesting a possible way

to do this, but added, "I'll be honest. I think that this would throw off most hunters."

Paul and I tended to agree with him, but we thought we'd give it a go anyway. This morning, Paul, Rick, and I headed out to the Pinckney State Recreation Area (US-3322). After getting set up, I suggested that what we might do is for me to spot myself and call CQ, and after getting a reply somehow indicate that a second operator, and therefore QSO, was available. The first transmission was pretty much standard, but after the hunter replied, I would send something to indicate that Paul was also there. Here's an example:

CQ CQ POTA KB6NU KB6NU POTA
W1ABC
W1ABC 599 MI BK
599 MA BK



TU NW W1ABC DE KW1L 599 MI BK (This is the crucial step. With this transmission, we're telling the hunter that there's a second station that want a contact, too.)

If the hunter responded with an exchange, we counted that as a contact for KW1L. If not, we didn't count it.

We experimented with slight variations of this format. For example, instead of just a single KW1L, we sent it twice. If neither transmission elicited a response, I would give another call, simply:

W1ABC DE KW1L 599 MI

This would sometimes get them to reply. Another trick that we tried was to slow down when sending that final transmission, thinking that that would be a clue that there was a second operator present. That seemed to work sometimes.

Overall, a little less than half the time, the hunter would get the idea and realize that we had a second operator. The other times, the

hunters either didn't understand what we were sending or tuned away after their transmission and didn't hear ours. If the latter, it's a shame because they could have had a second contact.

We made 12 contacts for Paul, after which, he decided to call it quits. So, he now has his first legal activation under his belt!

As a result of this experience, I would like to suggest that CW hunters listen to the final transmission of the activator in case there is a second operator present. I would also like to suggest that activators use the format:

TU NW <hunter call sign> DE <second activator call sign> <second activator call sign> 599 <state> BK

I'm not wedded to this, though, so if you have a better suggestion, please let me know.

~ Dan KB6NU



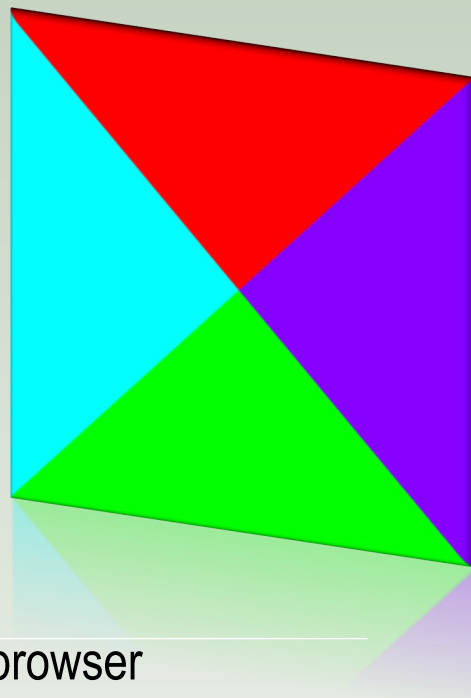
Ooops, they did it again...

It seems the photographers at QST have a penchant for ignoring the obvious. There was the snicker-worthy cover ([March 2017](#)) about safety with an attractive young lady in fall protection equipment that was totally inadequate. And who couldn't see that the cover "Ham Radio Goes to High School" ([September 2023](#)) featured a group of students working the bands wirelessly... without any radio connections.

This month we have "Repair it Yourself", and our well-intentioned tech appears to have only the positive (red) lead connected to his circuit under test... and he also seems to have forgotten to turn on his multimeter. Oh well.

~

Foundations of Amateur Radio



Listening to local RF via a web browser

by ONNO BENSCHOP VK6FLAB



**Onno Benschop
VK6FLAB**

To listen to the podcast, visit the website: <http://podcasts.vk6flab.com/>. You can also use your podcast tool of choice and search for my callsign, VK6FLAB.

Full instructions on how to listen are here: <https://podcasts.vk6flab.com/about/help>

Recently I discussed the idea of listening to the radio spectrum across the internet for the purposes of getting signal into your shack when radios, or in my case, antennas are causing you challenges.

I continued to explore and discovered a project by Jacobo EA1ITI, called "[radioreceiver](#)". Behind that unassuming name lies a tool born in 2014, that allows you to plug an RTL-SDR dongle into your computer, open up your web-browser, and listen to the radio signals that your dongle can receive.

In case you're unfamiliar, an RTL-SDR dongle is a small USB device, looks a lot like a USB thumb drive, jump drive, data stick or flash drive, basically a hunk of plastic with a USB connector on it. An RTL-SDR dongle generally also has some form of antenna connector. It's typically sold as a digital radio and digital television receiver, but websites like rtl-sdr.com sell purpose built ones. They can be found starting at about \$15.

I realise that this is using a local receiver, with a local antenna, but it's inside a web browser, which is half of what I expected. When you hit the play button in the bottom of the screen, you'll be prompted by your web browser to give permission to access your RTL-SDR dongle and the fun starts. You'll see a live waterfall, hear audio, and have the ability to tune to any frequency you can reach. Depending on your dongle, typically somewhere between 500 kHz and 1.76 GHz.

The application consists of seven files, a total of 352 kilobytes that you can store on any web server and run, with one caveat, in order for your web browser to talk to your dongle, it needs to be served using HTTPS. Jacobo has set-up radio.ea1iti.es and I've set-up sdr.vk6flab.com, both showing the same tool. You'll find the code on my VK6FLAB GitHub repository, and of course on Jacobo's.



There are some things you need to know. You will need to use a web browser that supports WebUSB, currently that's Chrome, Edge, Opera and several others, sorry, Safari and Firefox don't ... perhaps it's time to talk to Apple and Mozilla. All is explained if you click on the little question mark at the bottom of the screen, it will even tell you if the browser you're using to read the help is compatible or not.

If you have an Android phone, you can run this tool too, although you will need to find a way to connect your dongle to your phone. I'm currently limited in my ability to test this and you may need to install some drivers on Windows and Linux, but MacOS and presumably Android, works out of the box. The software also supports offline operation, so you can load it as a Progressive Web App, or PWA, and use it in the field away from the internet.

Did I mention that all the decoding is happening inside the web browser, so you can see which code is doing what .. and before you ask, yes, it's minimised in the browser, which you can make into human readable code, but when you look at the source, it shows precisely what is happening, all written in Node.js, TypeScript and JavaScript.

It supports CW, SSB, AM, Narrow and Wideband FM and decodes stereo, something which none of my amateur radios do.

You might be able to tell that I'm excited. It's because this is providing the basic functionality of a radio inside a web browser, and I didn't need to install it to get started. On the Macintosh I tested this on, I literally opened the web page, plugged in a dongle and hit play. Just so we're clear, just because this is using a web page on a web server, you accessing it will only give you access to your radio not mine.

This of course opens the doors to all manner of other fun stuff which I'm expecting to play with for the next little while, and yes, this is also Bald Yak adjacent, I'm aware.

In the meantime, you can play with this right now, sdr.vk6flab.com is the place to go. Word of warning, it's addictive and easy to forget it's a radio with an antenna plugged into your computer, so take precautions when electrical storms are about.

Look forward to hearing what you discover.

~ I'm Onno VK6FLAB



All podcast transcripts are collated and edited in an annual volume which you can find by searching for my callsign on your local Amazon store, or visit my author page: <http://amazon.com/author/owh>. Volume 7 is out now.

Feel free to get in touch directly via email: cq@vk6flab.com, follow on twitter: [@vk6flab](https://twitter.com/vk6flab) or check the website for more: <http://vk6flab.com/>

If you'd like to join a weekly net for new and returning amateurs, check out the details at <http://ftroop.vk6flab.com/>, the net runs every week on Saturday, from 00:00 to 01:00 UTC on Echolink, IRLP, AllStar Link, IRN and 2m/70cm FM via various repeaters.

If you'd like to participate in discussion about the podcast or about amateur radio, you can visit the Facebook group: <https://www.facebook.com/groups/foundations.itmaze>

This podcast episode was produced by Onno (VK6FLAB). You can find more at <http://vk6flab.com/>

Back to Basics

From The Canadian Basic Question Bank

Understanding decibels in Amateur Radio: S-Meters and power conversion



John Schouten VE7TI has been teaching amateur radio courses for over 25 years, and is the Course Coordinator for Surrey Amateur Radio Communications

In amateur radio, decibels (dB) are a fundamental unit for measuring signal strength, power ratios, and system performance. They provide a logarithmic scale to express large variations in power or voltage in a compact form, making it easier to compare signals and quantify changes.

'Back to Basics' discussed decibels way back in [September 2016](#), but in a general way. There are new questions in the updated Canadian Basic Amateur Radio Question Bank that took effect July 15th. This 'Back to Basics' explores decibels in the context of S-meters and power conversions, particularly focusing on the International Amateur Radio Union (IARU) standard for S-meter calibration, and explains how these concepts apply to amateur radio operations. There is some complex logarithmic math, but I'll try to simplify it for you. Here are three new questions related to decibels:

B-002-006-007

Your receiver's S-meter is calibrated to a standard of 6 dB per S-unit per a recommendation by the International Amateur Radio Union (IARU). The S-meter shows S9 when receiving a station transmitting with 100 watts.

Neglecting propagation changes, what transmitter power would cause your receiver's S-meter to read S8?

- A. 75 watts
- B. 50 watts
- C. 33 watts
- D. 25 watts





B-005-008-010

The power of your transmitter is 100 watts and your transmission line introduces a loss of 6 dB. How much power is delivered to the antenna?

- A. 50 watts
- B. 17 watts
- C. 33 watts
- D. 25 watts

B-005-008-011 (D)

A local amateur radio operator reports receiving your 100-watt 2-metre simplex transmission with an S-meter reading of "30 dB over S9." What power could you use to reduce that reading to S9?

- A. 1 W
- B. 10 W
- C. 33.3 W
- D. 0.1 W

What Are Decibels?

Here comes the complex math... A decibel is a logarithmic unit that expresses the ratio of two power levels. In radio, it's used to compare transmitted or received signal power, antenna gain, or system losses. The formula for power in decibels is:

$$\text{dB} = 10 \cdot \log_{10} \left(\frac{P_2}{P_1} \right)$$

where P_2 and P_1 are the two power levels being compared. Complicated math if you've been out of school for a while. But, remember, a positive dB value indicates an increase in power, while a negative value indicates a decrease. For example, a 3 dB increase doubles the power, and -3 dB halves it. A 6 dB change corresponds to a fourfold change in power (since $10^{6/10} \approx 4$).

Practical Decibel Conversions

Understanding dB conversions is important for amateurs, whether it is in reading your 'S' meter, calculating antenna gain of transmission line loss.

Here again are key approximations: 3 dB doubles (or halves) power. For example, increasing power from 100 watts to 200 watts is a 3 dB gain.

- 6 dB: Quadruples (or quarters) power, as seen in the S-meter example.
- 10 dB: Multiplies power by 10. For instance, 1000 watts to 100 watts is a 10 dB decrease.
- 20 dB: Multiplies power by 100, as $10^{20/10} = 100$.

These simpler rules help hams calculate changes in signal strength or power requirements, both for the exam, and for later use in practise.

Applications in Amateur Radio

Decibels simplify analysis of antenna gains, feedline losses, and amplifier performance. For instance, an antenna with 6 dB gain quadruples the effective radiated power in its main lobe. Similarly, a feedline loss of 3 dB halves the power delivered to the antenna. Hams use these calculations to optimize their stations for better signal reports. In summary, decibels and IARU-standardized S-meter calibrations provide a universal language for amateur radio operators to quantify and compare signal strengths. Mastering dB conversions empowers hams to make informed decisions about power levels, equipment, and signal optimization, enhancing their ability to communicate effectively.

In the first sample question,

An S-meter on a receiver displays the received signal strength in "S-units," a relative scale. The IARU recommends that S-meters be calibrated so that each S-unit corresponds to a 6 dB change in received signal power. This standard ensures consistency across amateur radio equipment. Typically, S9 is a reference point, often corresponding to a signal strength of 50 microvolts at the receiver's input (for HF bands).

Each S-unit below or above S9 represents a 6 dB decrease or increase in signal power, respectively.

For example, if an S9 signal is received from a station transmitting at 100 watts, dropping to S8 means a 6 dB reduction in received power. Since received power is proportional to transmitted power (assuming constant propagation conditions), a 6 dB decrease corresponds to dividing the transmitted power by 4.

Thus, the transmitter power for an S8 reading would be:

$$100 \text{ watts} \div 4 \approx 25 \text{ watts}$$

So the correct answer is D. 25 watts.

Conversely, increasing from S9 to S9+6 dB (often shown as "6 dB over S9" on the meter) requires quadrupling the power to 400 watts.

If you can remember that a doubling is 3 dB and a halving is -3 dB, then you can apply this to the question. -3dB of 100 watts = 50 watts, halve it again by another -3db and you get the same answer, 25 Watts.

In the second sample question,

A 6 dB loss in the transmission line means the power is reduced by a factor of 4, as 6 dB corresponds to a power ratio of $10^{-6/10} \approx 0.25$.

So, starting with a transmitter power of 100 watts, the power delivered to the antenna is:

$$100 \text{ watts} \div 4 = 25$$

Therefore, 25 watts is delivered to the antenna.

So the correct answer here is D. 25 watts.

reduction required based on the S-meter reading and then calculate the new transmit power.

An S9 signal corresponds to a reference signal strength, typically 50 μV at the receiver input for a 50-ohm system. The reading "30 dB over S9" means the received signal is 30 dB stronger than S9.

This means the received power at "30 dB over S9" is 1000 times the power at S9. To achieve an S9 reading, we need to reduce the received power by a factor of 1000, or (10^{-3}) . In free-space or line-of-sight propagation, received power is proportional to transmitted power.

Thus, to reduce the received power by a factor of 1000, we reduce the transmit power by the same factor.

Every 10dB increases or decreases the strength by a factor of 10. So, working backwards from S9 + 30db (our starting 100 watts):

S9 + 20dB has dropped it by a factor of 10 which is now 10 watts,

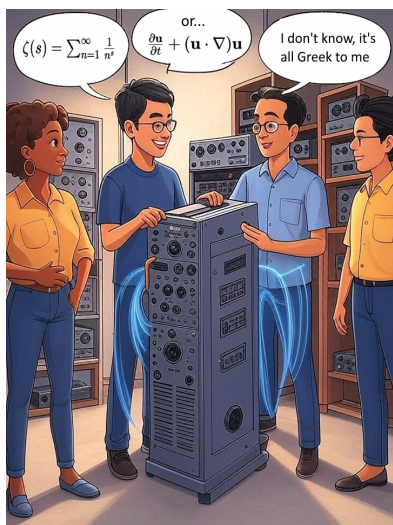
S9 + 10dB dropped by another factor of 10 which is now 1 watt,

And finally S9 dropped by a factor of 10 again, to our final answer of .1 watt.

Therefore, reducing your transmit power to 0.1 watts (100 milliwatts) should result in an S9 reading at the receiver, assuming all other factors (distance, antenna gains, etc.) remain unchanged.

Expect one question on decibel calculation on your Canadian Basic exam.

~ John VE7TI



Here again, a doubling is 3 dB and a halving is -3 dB, then you can apply this to the question. -3dB of 100 watts = 50 watts, halve it again by another -3db and you get the same answer, 25 Watts.

Sample question #3:

To reduce the received signal from "30 dB over S9" to S9, we need to determine the power

Crossword

This puzzle came from an old issue of Popular Electronics from the 1960's. Some of the answers will be easy for the older readers but may pose a challenge for the younger ones.

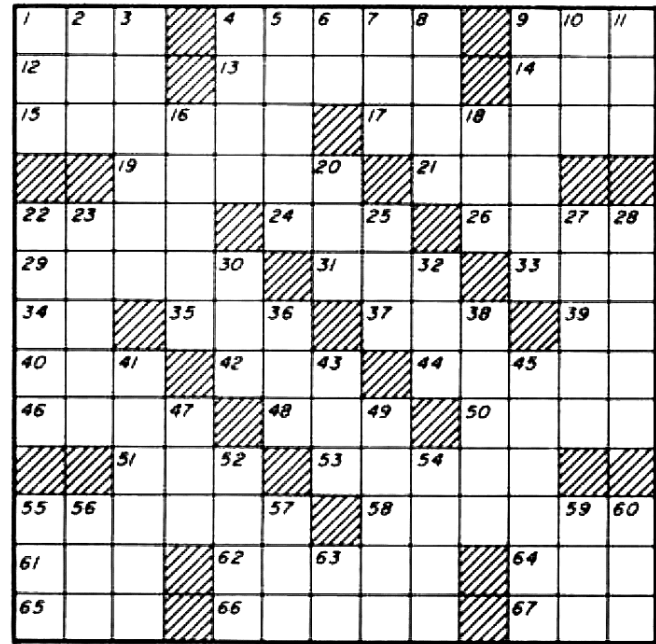
ACROSS

- 1 Rotating part found in analog computers
- 4 Part of a circuit having one function
- 9 Street: German abbrev.
- 12 Khan
- 13 Planet path
- 14 it disappears when you stand up
- 15 Type of lever switch
- 17 Element used in the coating of vacuum tube cathodes
- 19 Standing waves have them
- 21 Boy
- 22 Length times width
- 24 Single-cotton covered: abbrev.
- 26 One of equal rank
- 29 Units of electrical power
- 31 Unit of work
- 33 Electronics Corporation: abbrev.
- 34 Preposition
- 35 Distress call
- 37 Rowing implement
- 39 High frequency: abbrev.
- 40 Rhode Island Academy: abbrev.
- 42 ____ generator used on CRT color TV sets

- 44 Common use for No. 47 bulb
- 46 Ages
- 48 ____ cell uses liquid electrolyte
- 50 Girl
- 51 Eight: combining form
- 53 Titled
- 55 Lead coming from the side of a component
- 58 Small capacitor in series with main tuning capacitor
- 61 Suffix used in chemistry
- 62 Loudspeaker diaphragms
- 64 Ohm's law: abbrev.
- 65 Found inside thyratrons
- 66 Potentiometer networks used in audio distributing circuits
- 67 Notes in music

DOWN

1. cat whisker
- 2 In the past
- 3 Used to attract iron
- 4 Made a sale
- 5 Sometimes suitable for supporting an antenna
- 6 Type of battery pack used in portables.
- 7 A plate machined to hold other parts in place.



- 8 Latin phrase meaning: "and others"
- 9 Moving part in a potentiometer
- 10 Greek letter
- 11 Dial calibration used in tachometers.
- 16 Some believe they eat tin cans
- 18 Light blow
- 20 Single cotton enameled: abbrev.
- 22 Conscious of
- 23 Type of FM detector circuit
- 25 Cathode-ray oscilloscope: abbrev.
- 27 Seen on radar screens
- 28 Floating platforms
- 30 Soil
- 32 Spark ____ transmitter
- 36 Plant seeds
- 38 Vexed
- 41 Diodes have them
- 43 ____ calls used by CB'ers
- 45 Adjustable attenuator network
- 47 Science: abbrev.
- 49 Sounds are ____ at recording studios.
- 52 Diplomacy
- 54 Matter has ____
- 55 Slang for station equipment
- 56 Collection of information.
- 57 Cut off
- 59 Electronic industry association: abbrev.
- 60 Railroads: abbrev.
- 63 Continent: abbrev.

Electronics - November 1961

[Answers on page 95](#)



"What Could Go Wrong?"

I note how the guy's wife is feigning interest in hubby's latest project, while probably thinking about how long it will be before the house catches on fire.

~ Kevin VE7ZD/KN7Q

Danger in St. Elmo

A box of old blasting caps (mercury fulminate/KClO₃ mix) was just found in one of the old buildings in the mining town of St. Elmo, CO, 2 July 2015. When members of Historic St. Elmo and Chalk Creek Canyon Inc. cleaned out the outhouse behind the Home Comfort Hotel in St. Elmo, they found a potentially explosive surprise. On the floor of the outhouse, they found what they believed to be dynamite, said Walter Roth, a member of the historical group. Later in the day a bomb squad found blasting caps rather than dynamite.

i had operated there with my PRC319 Pedestrian Mobile right in front of that Hotel several times before. (See CQ Magazine June 2016, p. 16-18). While the electric blasting caps are usually shorted and would not be effected by a QRP radio, my 50W radio was at a dangerously high level to be transmitting near a box of blasting caps.

It would be a smart idea to avoid operating in any old mining areas where unexploded dynamite might exist.

~ Paul WØRW



Special Introductory RAC Membership Opportunity for New Amateurs

Message from the RAC President

Congratulations again on achieving your Certificate of Proficiency in Amateur Radio and welcome to Radio Amateurs of Canada! In recognition of your achievement, I'd like to offer you a free one-year membership which includes:

A subscription to the digital (eTCA) version of The Canadian Amateur magazine, with access to previous online issue. Opportunities to connect with local Amateurs through the RAC Affiliated Club Program which includes liability insurance for your personal Amateur Radio activities Access to annual RAC Contests, Special Events and Operating Awards Opportunities and discounts from various partner organizations Full member rights including participating in the decision making at RAC Annual General Meetings and in the election of RAC representatives. There are many great reasons to join RAC and I hope you will take advantage of this special offer by completing the introductory membership form provided below.

If you need any additional information please don't hesitate to contact me by email at president@rac.ca or by contacting the RAC Office at racgm@rac.ca.

– 73 (Best Wishes) and welcome!



**Radio Amateurs
of
Canada**



No-ham Recipes

Chili Con Rotini

by AUDREY WEST VE1PK

This is chili with a twist! Twist of rotini, that is. Rotini originated in northern Italy, and in Italian, rotini means "twists." So it is no surprise that rotini is a type of highly twisted pasta, related to fusilli. The tight twists help these types of pasta retain sauces better.

- 1½ pounds (675 grams) minced (ground) beef
- 2 garlic cloves or garlic puree (½ teaspoon (2.5 ml) = 1 clove garlic)
- 3 onions, chopped
- 2-14 ounce (435 ml) cans red kidney beans plus their liquid
- 1 can of mushrooms, stems and liquid
- 19 ounce (570 ml) can Italian tomatoes
- 1 teaspoon (5 ml) salt
- 2 teaspoons (10 ml) chili powder
- 1 teaspoon (5 ml) red pepper, crushed
- 3 handfuls dried rotini
- 2 large cans tomato soup
- ½ bunch celery, chopped
- Dash of ground black pepper
- ¼ teaspoon (1.25 ml) paprika
- 1½ teaspoons (7.5 ml) basil leaves

Brown the minced beef with the onion, garlic cloves (or garlic purée) and celery. Add remaining ingredients except for rotini. Simmer for two hours. Add rotini about 45 minutes before chili is finished cooking. Do not overcook the rotini. Rotini twists will fall apart with too much cooking.

~





September 2025

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	1	2	3	4	5	6
	Labour Day					Coffee: 0700 Denny's King George Blvd. & 68 Avenue OTC Open 0930 Route 66 SE
7	8	9	10	11	12	13
Run Surrey Run 07-Noon Route 66 Special Event	Route 66 Special Event	1930 SEPAR Net 2000 SARC Net Route 66 Special Event	SARC General Meeting 1900-2100 Route 66 Special Event	Route 66 Special Event	Route 66 Special Event 1958: Kilby and Noyce unveil first integrated circuit	Coffee: 0700 OTC Open 0930 Contest: WAE DX (SSB) Route 66 Special Event
14	15	16	17	18	19	20
Contest: WAE DX Contest (SSB) Route 66 Special Event	1921: Westinghouse's WBZ, Springfield, MA, receives broadcast license	CW Course (OTC) 1930 SEPAR Net 2000 SARC Net				Coffee: 0700 OTC Open 0930
21	22	23	24	25	26	27
	1899: DeForest seeks employment with Marconi29, 1926NBC incorporated	CW Course (OTC) 1930 SEPAR Net 2000 SARC Net	SARC Directors Meeting 1900-2100			Coffee: 0700 OTC Open 0930 Contest: CQ WW DX (RTTY)
28	29	30				
Contest: CQ WW DX (RTTY)		CW Course (OTC) 1930 SEPAR Net 2000 SARC Net		Event details: SARC-SEPAR 'Live' calendar link All contest information: WA7BNM Contest Calendar: Home		



October 2025

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
			1	2	3	4
Event details: SARC—SEPAR 'Live' calendar link All contest information: WA7BNM Contest Calendar: Home					1837: Morse files a caveat on the telegraph with U.S. Patent Office	Coffee: 0700 Denny's King George Blvd. & 68 Avenue OTC Open 0930
5	6	7	8	9	10	11
		SARC 50th Anniversary CW Course (OTC) 1930 SEPAR Net 2000 SARC Net	SARC General Meeting 1900-2100			Coffee: 0700 OTC Open 0930
12	13	14	15	16	17	18
	Canadian Thanksgiving	CW Course (OTC) 1930 SEPAR Net 2000 SARC Net			1919: RCA established	Coffee: 0700 OTC Open 0930
19	20	21	22	23	24	25
		CW Course (OTC) 1930 SEPAR Net 2000 SARC Net	SARC Directors Meeting 1900-2100			Coffee: 0700 OTC Open 0930 Contest: CQ WW DX (SSB)
26	27	28	29	30	31	
Contest: CQ WW DX (SSB)		1930 SEPAR Net 2000 SARC Net		1745: Invention of the Leyden jar (the first capacitor)		

Radio-Active

Profiles of SARC members

Michael Papp WB6GJE

presented by BLAKE R. WIGGS VA7BWG



Michael WB6GJE

Much of my fascination with, and love for, Canada (and radio) can be attributed to my father. After World War II, my father immigrated to Canada in search of a free and open society where he could build a future centered around his passion for running a small business and his love for motorcycles. He became a Canadian citizen and successfully ran a motorcycle sales and repair business in Toronto. Many years later, he met my mother while she was on vacation from New York City. They married and eventually moved to New York City to be closer to her extended family.

Another passion of my father's was shortwave radio. During World War II, shortwave radios were the sole means of receiving news and communicating with others, so he became quite skilled in radio communication and proficient in Morse Code. Despite his busy schedule running a business and raising a family, he dedicated himself to teaching me everything he had learned about shortwave propagation, using HF radios, and even the ability to send (relatively slow) Morse code!

Eventually, we relocated to Seattle, and my parents took me on extended vacations to Vancouver and Victoria, British Columbia. While I will always cherish my love for Seattle and the Olympic Peninsula, I thoroughly enjoyed the vibrant international culture of Vancouver that we experienced while residing in New York City. Vancouver Island was where I was introduced to camping, a passion that has endured to this day.



Growing up, my mother nurtured a love for science in me. I eagerly participated in all the requisite chemistry and geology sets, constructed a Tesla coil, and actively engaged in the science clubs at school. As a junior in high school, my father took me to a radio supply store in Mountain View (we had moved to California by that time). The sight of the equipment and the interactions with the amateur radio operators who formed a community around the shop captivated me. I passed my Technician exam approximately a month later. At the time, amateur exams required a Morse code proficiency, and my early instruction in that skill proved invaluable! It's worth mentioning that I took my Technician exam in the very same radio supply shop, and I believe I impressed the staff with a code speed of 12 wpm, even though only 5 wpm were required.

After high school, I pursued a mathematics degree at college. Living in a dormitory, I lacked space for my substantial (tube) transmitter nor an antenna, so I could only rag chew with my radio friends during weekend visits with my parents. Eventually, I lacked the time to practice my amateur radio skills and let my license expire. My time was now focused on starting my career in software engineering. I accepted an intern role at one of the microprocessor startups in what was to become Silicon Valley during my junior year in college. They had me wire wrapping prototype system boards and performing some basic bring-up tasks. At that time (mid-70's), computer science majors believed that working with these "tiny" microprocessors was a waste of time, as their careers were headed towards mainframes. When my managers discovered that I had taken computer science classes in college, they quickly taught me assembly language and the use of a logic analyzer, and I was promptly placed on their programming staff. A few years later, I embarked on my career formally at Apple Computer, contributing to the development of tools for operating systems and new hardware development teams.

Over the past 40+ years, I have worked at most of the software companies whose names you would recognize. Perhaps not surprisingly, I ended up back where I started, managing a software team that creates and maintains tools used to support

the development of new hardware products at Apple. While my "work/life balance" didn't offer much time to pursue my passion for amateur radio, it was always my desire to regain my license and build a shack where I could enjoy this abiding interest.

When I 'retired' in 2021, one of my first initiatives was to pass my Technician exam. In short order (about a year), I passed my General and Extra exams as well. I have built that shack I dreamed about in a spare bedroom, acquiring some Yaesu rigs (FT-991A and FT-710). I have also built an EFHW in my backyard and pieced together various items such as a nanoVNA, tinySA spectrum analyzer, power supplies, some HTs, etc.

When I mentioned retirement in quotes, my intent was not to sit by some pool and put my brain on hold. And while I had some naïve notion that my return to amateur radio was about electronics and hardware, I soon learned that the "art and practice of radio communication" was now equally (if not more so) focused on software (as in Software Defined Transceivers).

So I have started some new projects in my life:

- I'm developing open-source software (announcements to come) that utilizes AI-enabled PCs and AI-accelerated Raspberry Pis to control transceivers. Initially, I'm





working with Hermes-based hardware, but I plan to expand to hardware from Yaesu, Icom, and Flex.

- I've also developed some software that runs on Raspberry Pis with an attached RTL-SDR dongle (or similar) to scan for repeaters and other amateur radio activity using a cheap/simple antenna. I'm currently developing server-side software that will work with Internet-attached Pis. The client software will anonymously relay their logs to the server for analysis. The server will then provide a public interface and APIs for the amateur community and organizations like frequency coordinators to track activity. All of this will be open-source and available to individuals or groups to host on their own servers.
- Lastly, there are a few open-source and commercially available software packages intended for server deployment that offer radio propagation analysis. Specifically, these packages allow users to input their location, frequency, power, antenna specifications, and so on, and the software returns a propagation/coverage map for their transmitter. I'm working with two individuals to package their software so that it can be hosted on any server at no cost (although not as open-source). In my opinion, the more widespread availability of this software would be beneficial to the amateur radio community. However, my contribution would be to bridge the software described in the previous item with these packages. Among the many capabilities this integration would provide are the ability to view real-time repeater activity (with coverage maps), a local RBN with instantaneous feedback, and a means for potential repeater owners to determine the details of their installation at the earliest stages of planning for deployment.

All of this has led me to my interest in the Surrey Amateur Radio Club (SARC). I first learned about the club through *The Communicator*. SARC members should be proud that among all the hams I know on the West Coast, *The Communicator* is recognized as the best general amateur radio publication available today. The fact that the staff are volunteers and the publication is published online for the entire radio community worldwide is deeply appreciated by

all. While there are many excellent newsletters published by amateur radio clubs, their focus is intentionally on local news, events, and club happenings. *The Communicator*, on the other hand, offers articles of interest to all hams, providing education, news, and practical projects that are useful to everyone involved in amateur radio.

Intrigued by the club, I soon discovered that the SARC has an amazing group of talented, enthusiastic members, staff, and officers that set it apart from most of the organizations I've encountered during my return to this hobby. The scope of education, exams, emergency preparedness, and club activities makes the SARC a rival if not an envy of ham clubs everywhere.

As I learned more about the club, I realized that I had to become a paying member to support all these activities. I also became enthusiastic about the idea of taking the basic amateur radio exam for a Canadian license by enrolling in SARC's excellent exam preparation classes. This introduced me to John Schouten, John Brodie, and other wonderful officers and staff at the club. Their encouragement and support for someone they just met online exceeded all expectations.

However, during the course, the ISED changed the requirements, requiring even online examinees to be physically present in Canada. Disappointed yet understanding the rationale for this change, I remain undaunted (and still have the support of my friends at the SARC). Although it was too late to prepare for the exam and travel to British Columbia before the new exam question pool took effect, I plan to complete the RAC course early next year and take an extended vacation in British Columbia to take the exam. More importantly, I want to meet in person all the wonderful people I've had the honor of meeting at the SARC.

~ Michael WB6GJE



SARC News

Last call for SARC membership renewals

If you are one of the 3 dozen SARC members who have not yet paid your 2025-26 annual dues and are therefore “not in good standing”, you are requested to remedy this as soon as possible and restore your membership status. Payments can be made by e-transfer or Paypal to payments@ve7sar.net.

New microwave group formed (PNWMW)

Dino VE7NX and Scott VA7SC, along with Kirk VA7RKM in Victoria, and Frank AG6QV and Ray W7GLF in Washington, launched a new group which they call Pacific Northwest Microwave Group (PNWMW). More recently, Alex VE7IRU in Nanaimo on Vancouver Island, has joined. These enthusiasts meet on the airwaves the first Sunday of every month to push back the frontiers. So far, the BC contingent located on

Cypress Mountain in North Vancouver has successfully completed 10 GHz contacts with the US members Frank and Ray located in different grid squares near Seattle by bouncing signals off Mt. Rainier. The next challenge for the Fall is 24 GHz via this or other path.

Replacement of cable on Bigfoot tower

Members have approved a significant expenditure for replacement of damaged cable on our ‘Bigfoot’ tower. More details will be forthcoming.

Reminder... Change to Winlink net

To participate, send a Winlink message to VE7ADF every 1st and 3rd Monday of the month with the subject line SEPAR Winlink Net. Any Winlink mode is welcome including Telnet. You will then receive a Winlink reply from the net control with a tip or a task to complete.

SARC has two Winlink Gateways, one at Surrey Firehall 1 using callsign VE7HME-10 on 145.710 MHz and a second on Concord tower using callsign VE7ADQ-10 on 145.770 MHz, packet 1200 Baud and VARA FM Wide capable. Note: VE7HME-10 gateway is temporarily out of service while Internet issues at Firehall 1 are being resolved.

A new beam antenna for the OTC

An antenna to replace its venerable TH7... a [Momo Beam Penta10](#) for 5 bands: 28 MHz, 24 MHz, 21 MHz, 18 MHz and 14 MHz.



On Saturday, July 26, amateur radio enthusiasts from both of the U.S.-Canada border gathered at Peace Arch Park for the second annual HAMS at the Border event, running from 10 a.m. to noon. The event drew over 50 attendees from the Lower Mainland in British Columbia and Blaine and Whatcom County in the U.S., compared to about 30 who braved last year’s rainy gathering.

Aimed at fostering camaraderie, the event allows hobbyists to discuss their passion, enjoy coffee, and connect, with one member broadcasting a “net” from the park’s parking lot behind the duty-free store.

Darryl Finlay VA7CQD, part of the Surrey Amateur Radio Communications and the Surrey Emergency Program Amateur Radio group, highlighted the hobby’s appeal across ages and backgrounds, driven by the technology’s ability to connect globally via handheld devices.

The event was covered by local media, and reporter Tracy Holmes filed a story Peace Arch News. You can read it at:

<https://www.surreynowleader.com/home/hamming-it-up-amateur-radio-enthusiasts-to-converge-on-peace-arch-park-8155332>

~ Surrey Now-Leader



The SEPAR Report

Emergency Program Net Strategies

by GORD KIRK VA7GK



Gord Kirk VA7GK
is a SARC Director
and the City of Surrey
SEPAR Coordinator

It is that time of year again when the Fall activities begin. We are looking forward to returning back to regular meetings and training sessions. Over the last several years we have maintained our weekly SEPAR nets year-round. In the past these nets were put on hold over the summer as we often saw lower than normal attendance. We often also had trouble with net control stations.

As some of regular members talked about this issue, we made the decision to keep the nets active. Emergency incidents do not take holidays and don't care if you have a net controller. We have also built a regular net controller operator (NCO) schedules and have a list of alternate people to run a net. We have Reg VA7ZEB who has volunteered to take on the role of Net Controller scheduler. If one of our regular net controllers cannot

find someone to take over, they can reach out to Reg who will put out a call and help find someone to fill in.

As well we have published on our website the Net Script and NCO schedule for the nets. We have let volunteers know that the script is located there and anyone can run a net if the start time passes and the net does not start. This has actually happened a couple of times over the last couple of months. The net start time passes and someone asks do we have a net controller? Usually some says give me a minute and I'll bring up the script and run the net.

As part of our regular training discussions, we encourage new people to try running a net. We help them with the script and answer questions and offer lots of encouragement to try. This does give us some new operators willing to fill in on an irregular basis. There is an operational purpose for this support of new people trying out



as net controllers. Again emergencies/disasters are not scheduled. As part of the BC Shakeout Exercise, we ask members to turn on their radios after the shaking stops and start a net. This could mean anyone starts a net and then hands net control off to another NCO when appropriate.

This also leads to another part of our weekly SEPAR net. Each week we move to an alternate frequency, a primary or secondary simplex frequency or alternate repeater (e.g. move to our UHF repeater from the VHF repeater). This allows individuals to understand their ability to communicate from their location to other regular net check ins when using simplex. This also allows members to understand how relays work and how they might need to use a nearby station if they cannot reach a station they need to. The other advantage of this switch is that it helps to ensure radios are programmed with alternative repeaters and simplex frequencies our emergency program uses. It also helps some newer members to get practice using their radios, changing bands and channels. It sometimes also helps people to understand how to program a frequency into their radio without using programming software.

To summarize our Net Strategy for an Emergency Radio Program:

1. Hold the net on a regular basis, year-round.
2. Have someone volunteer to be the Net Control scheduler.
 - a. Pick a week per month for individuals, e.g. Gord does the first week of the month, Andrew does week 2, Rob does week 3 etc. On those months with a 5th week have a volunteer that cannot commit to every month, or use new people to try out as NCO during these 5th weeks. This happens 4 times per year.
 - b. Have a list of alternate people who may be the NCO for a week every now and then.
 - c. Have each net controller try and cover their own shift if they have a conflict cannot run the net. If they don't have success reach out to the scheduler for help.

3. Publish the net script and calendar on the website.
4. Encourage new amateurs to run a net every now and then.
5. Remind everyone these should be fun and to be patient with new net control operators.

The result of this strategy has been weekly participation between 12-20 (or more) amateurs weekly even throughout the summer weeks.

We also have an upcoming city 5k and 10k run called Run Surrey Run in early September. This kicks off our fall activities and is another great way to practice communications during an actual event. We will have a net controller, volunteers around the course and an operator in the City's event EOC (Emergency Operation Centre). This will have coordination between the race organizer, volunteer medical staff, Police etc. We will report out on this in a future Communicator Article.

As a reminder with fall weather, we move from sunny days to rain, possibly wind and other impacts caused by adverse weather. It is a good time to check your equipment, batteries, antennas etc. As volunteer communicators remember to be prepared.

As always if you have any questions please reach out.

Our SEPAR/SARC team is a community that is welcoming and open to have you drop in and join us. I hope you will one day drop in and say hi.

~ Gord Kirk, VA7GK
Volunteer SEPAR Coordinator

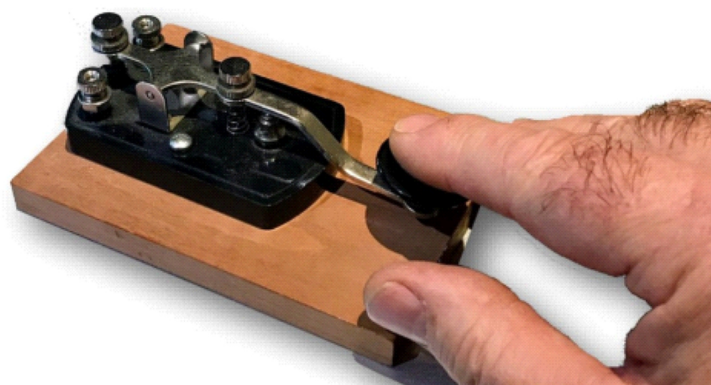
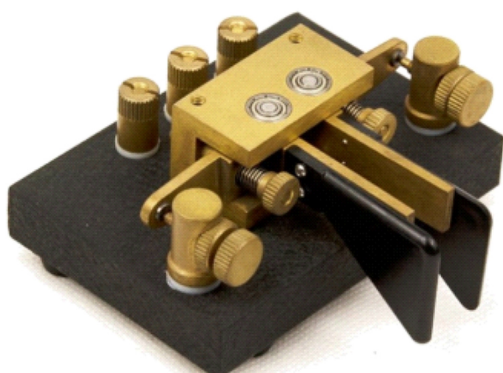
SURREY AMATEUR RADIO CWcourse

OBTAIN YOUR MORSE CODE ENDORSEMENT

6 WEEKS · TUESDAYS · 7-8:30 PM · \$25

Starts September 19, 2025 - For information contact course@ve7sar.net

At our training facility · 5756 142 Street · Surrey



You may pay by e-transfer to payments@ve7sar.net, or via [PayPal](#). Please include 'CW Course' in the remarks field. To be successful, this course relies on practice at home between instructional sessions.

This course is for the absolute beginner or student wishing to improve speed, but no previous CW experience is required.

At no time in this course should you use any visual aids or look up tables. The course material is sound based and focuses on pattern recognition, not counting dits and dahs. Repeat each session as many times as necessary until you are confident that you can recognise the sound of the letter, number, punctuation, or prosign.

We recommend several daily training sessions, spaced at least one hour apart, for the duration of the course. By doing so you could achieve an adequate level of CW operation to participate in typical SOTA, POTA, and similar short form QSOs in about 6 to 8 weeks. Experience has shown that this regular, daily, short period time commitment is essential in becoming proficient at copying and sending good quality CW.

Your facilitator is Stan Williams VA7NF

A new beam antenna for the OTC

Our new [MOMIBEAM PENTA10](#) FIVE BAND YAGI is the popular multiband Antenna with a compact design that covers the bands of 10-12-15-17-20 meters using a single coaxial cable. All elements are full size, with performances said to be superior to those of the old generation antennas. The element spacing has been carefully designed using the latest generation simulation software to ensure optimal performance. The square boom provides life long, perfectly aligned elements, and telescoping tubing ready for rapid deployment.

The 3kW RF Choke balun is also supplied as standard. This component is very expensive and many antenna manufacturers supply it as an optional extra.

The Momobeam Penta10 five band yagi antenna is advertised as having excellent performance and compact dimensions.



PENTA 10
10 · 12 · 15 · 17 · 20

SPECIFICATIONS

BAND	10 meters (28 MHz)	12 meters (24 MHz)	15 meters (21 MHz)	17 meters (18 MHz)	20 meters (14 MHz)
Gain dBi*	12,3	12,5	11,5	11,6	12,0
Gain in free space dBd	4,7	4,9	4,0	4,1	4,5
Front/back	25	15	15	15	15
Elements	2	2	2	2	2
SWR	800 KHz	100 KHz	450 KHz	100 KHz	350 KHz
Longest element: 1100cm / 36ft.					
Boom length: 390cm / 12.8 ft.					
Max tower lift side: 50cm					
Closest element to mounting point: 25cm/10 inches					
Turning radius: 590cm / 19.4 ft.					
Feed: 50 Ohm balanced - single coaxial cable					
Mast diameter: 50 to 60mm 2/2.4 inches (larger on request)					
Wind area: 0.79 m² / 8.6 sq ft.					
Wind survival***: 160 Km/h - 100 MPH					
Wind load 130Km/h: 635 N					
Balun: 3 KW rated included					
Weight (excluding packaging): 27kg / 60lbs.					

* gain at 20m height on real ground

** maximum wind speed at which there is no permanent deformation of the antenna

If you're ever lost or stranded and your phone battery is low, change your voicemail to a message that gives your approximate location, the time, the date, your situation & instructions to help. When your phone dies, your voicemail will still work & those calling will be able to help. Pass this on, it could save a life.

Solution to Crossword Puzzle

C	A	M		S	T	A	G	E		S	T	R
A	G	A		O	R	B	I	T		L	A	P
T	O	G	G	L	E		B	A	R	I	U	M
			N	O	D	E	S		L	A	D	
A	R	E	A		S	C	C		P	E	E	R
W	A	T	T	S		E	R	G		R	C	A
A	T		S	O	S		O	A	R		H	F
R	I	A		D	O	T		P	I	L	O	T
E	O	N	S		W	E	T		L	A	S	S
			O	C	T		N	A	M	E	D	
R	A	D	I	A	L		P	A	D	D	E	R
I	N	E		C	O	N	E	S		E	I	R
G	A	S		T	P	A	D	S		R	A	S

Always say you saw it in—POPULAR ELECTRONICS



The Learning Benefits and Cost Savings of Building Your Own Antennas

Empowerment, Exploration, and Economy in Amateur Radio

by JOHN SCHOUTEN VE7TI

Amateur radio is often celebrated for its ability to connect people across the globe, foster friendships, and bridge cultural divides. But for many radio enthusiasts, the real magic unfolds not only over the airwaves but also on their workbenches, where wires, connectors, and calculators come together in a creative and educational process: building homemade antennas. Crafting your own antennas is more than a practical exercise—it is a pathway to hands-on learning, intellectual growth, and notable financial savings. This essay explores the profound educational benefits and economic advantages of constructing your own antennas, and why it is a worthwhile pursuit for both aspiring and experienced radio operators.

Unlocking Hands-On Learning and Technical Mastery

Building your own antennas is a deeply rewarding learning experience. The process begins with fundamental research—understanding various antenna types, their theoretical principles, and their practical applications. Whether you are

constructing a simple dipole, a Yagi-Uda array, or an experimental design, you must engage with core concepts such as resonance, impedance, polarization, wave propagation, and the nuances of different frequency bands. This journey transforms abstract textbook knowledge into something tangible, as you measure, cut, and assemble components to bring theory to life.

Throughout the construction process, builders practice problem-solving and critical thinking. Every antenna project comes with its own set of challenges, from selecting the right materials to troubleshooting unexpected performance issues. These challenges cultivate patience, perseverance, and adaptability. As your understanding deepens, so too does your confidence—not only in your technical skills but in your ability to tackle complex problems independently. Over time, the antenna builder becomes fluent in using analytical tools such as SWR (standing wave ratio) meters, antenna analyzers, and software simulations, all of which strengthen their foundational knowledge of radio electronics.



Fostering Innovation, Creativity, and Experimentation

The world of antenna building is rich with opportunities for creativity and experimentation. Unlike commercial products, which tend to follow standard designs and specifications, homemade antennas can be customized to suit your unique operating needs, available space, or even aesthetic preferences. This freedom invites experimentation with unusual configurations, new materials, and cutting-edge digital modeling techniques. Builders quickly learn that there is rarely a single “right” way to construct an antenna—instead, success often comes through trial, error, and innovation.

For those interested in scientific discovery, building antennas opens the door to real-world experimentation. You can test the impact of height, orientation, or environmental conditions on signal strength and clarity, and you can document your results to share with the broader amateur radio community. This spirit of inquiry not only advances your own expertise but also contributes to the collective body of amateur radio knowledge, inspiring others to experiment and learn alongside you.

Cost Savings: Stretching Your Budget Further

A major incentive for building your own antennas is the significant cost savings compared to purchasing commercially manufactured models. High-quality commercial antennas, especially those designed for specialized or multi-band use, can be expensive. The costs can be prohibitive for newcomers to amateur radio or for hobbyists seeking to explore multiple bands and modes.

By sourcing your own materials—such as copper wire, aluminum tubing, PVC pipes, and hardware from local suppliers or even recycled components—you can often construct antennas at a fraction of the commercial price. For example, a simple wire dipole can be made for less than the cost of a fast-food meal, while even more complex designs can be built for just a modest investment in raw materials. The savings add up quickly, especially if you frequently experiment or require antennas for different frequencies or portable operations.

Case in point, the PERformer multiband HF antenna profiled in this issue. Once you have built it, you know it. Home-built antennas can be easily repaired or modified when needed, without the expense or wait times involved in ordering replacement parts. This flexibility further amplifies the economic benefits, as adjustments and upgrades can be made using affordable, readily available materials.

Building Community and Expanding Knowledge

Constructing antennas is not only a solitary pursuit—it is also a doorway to community engagement and knowledge exchange. Local radio clubs SARC included, often host “build nights,” workshops, or antenna competitions, creating opportunities for learning from peers, sharing techniques, and celebrating creative solutions. We include a workshop on building and tuning a J-pole dual band antenna as part of our Basic course.

Online forums and publications abound with how-to guides, experimental results, and stories of both triumph and failure. The collaborative culture within amateur radio encourages mentorship, so newcomers can benefit from the wisdom of more experienced builders, while veterans glean fresh ideas from enthusiastic beginners.

Empowerment Through Building

Building your own antennas is a journey that offers far more than a functional piece of equipment. It is a process that builds technical skills, nurtures creativity, and stretches budgets in meaningful ways. As you design, build, test, and refine your creations, you join a long tradition of amateur radio operators who have advanced the art and science of communication through curiosity, ingenuity, and resourcefulness. Whether you are motivated by the thrill of experimentation or the satisfaction of saving money, constructing your own antennas stands as one of the most rewarding and empowering experiences in the world of amateur radio.

~ John VE7TI

HAM LEFTOVERS...

The radio autoencoder (RADE)

Radio Autoencoder (RADE) technology is a new approach to sending speech over HF radio. It combines Machine Learning (ML) with classical DSP to send high quality speech over HF radio at SNRs as low as -2dB. The speech signal has an audio bandwidth of 8kHz, but the RADE V1 signal requires just 1500Hz of RF bandwidth. The Peak to Average Power Ratio (PAPR) is less than 1dB, allowing efficient use of transmitter power amplifiers. The You-tube video on the technical aspects of FreeDv and Machine Learning aspects can be found at: <https://youtu.be/hengWrNZlc4>

HAM operators prepare for Atlantic hurricane season

As Atlantic Canada gears up for another hurricane season after a year of unprecedented disasters linked to climate change — including post-tropical storm Fiona last September — amateur radio operators say a simple technology can play a part in the response to disasters across the region. CBC: <https://www.cbc.ca/news/canada/nova-scotia/cimate-change-telecommunications-ham-radio-help-1.6884108>

Proving again that the Xiegu G90 will tune almost anything

Kevin K0KLB has the Great Plains and cornfields... and he has FUN experimenting. It's corn stalk antenna season in Iowa where the plants are juicy, wet and perfect for radiating RF power. Using the Xiegu G90 auto tuner he was curious if it would tune up the plant and make QRP SSB contacts. It was a lot of fun to design and build this "a maize'ng" antenna... <https://youtu.be/GMO0lJedluc>

Morse code world record

You won't believe the speed at which this teen can copy random CW callsigns, setting a Guinness Book world record at a recent European competition: <https://youtu.be/Gkn4SsUMMnI?si=S0SXi8nzp8XSLqbO>

The shortest day

On July 22, 2025, Earth completed its rotation 1.34 milliseconds faster than the standard 24-hour day, making it the second-shortest day on record since precise atomic clock measurements began in 1973. This continues a puzzling trend observed since 2020, during which Earth has repeatedly broken its own speed records — the shortest day to date was July 5, 2024, at 1.66 milliseconds short. While day length variations are not new over geologic time, the recent acceleration defies easy explanation and may point to changes deep within the planet. One leading theory attributes the shift to interactions in Earth's liquid core, which could be redistributing angular momentum and subtly speeding up the mantle and crust. Other scientists suggest melting polar ice and rising sea levels may be influencing Earth's rotation, though likely as a moderating factor rather than the main cause. Experts believe the acceleration may be temporary, and Earth's long-term trend toward slower rotation and longer days could soon resume. (ANS thanks [Space.com](https://www.space.com) for the above information)



Thank you recent visitors... 166 countries and counting—more than in my log!

	33,628		248		72		20		8		3		2		1
	21,857		217		72		17		7		3		2		1
	13,529		208		70		15		6		3		2		1
	3,738		190		70		14		6		3		2		1
	2,341		189		64		13		6		3		2		1
	2,005		188		48		13		6		3		2		1
	931		188		48		12		5		3		2		1
	903		181		46		12		5		3		2		1
	739		180		45		12		5		3		2		1
	733		176		43		11		4		3		2		1
	705		176		39		11		4		3		1		1
	587		174		34		11		4		2		1		1
	544		141		33		11		4		2		1		1
	452		115		31		11		4		2		1		1
	439		114		30		10		4		2		1		1
	375		106		30		10		4		2		1		1
	370		100		28		10		4		2		1		1
	351		93		28		10		4		2		1		1
	327		88		27		9		4		2		1		1
	307		82		20		9		4		2		1		1
	306		81		20		8		4		2		1		1

Reprint Policies

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We welcome your comments and feedback

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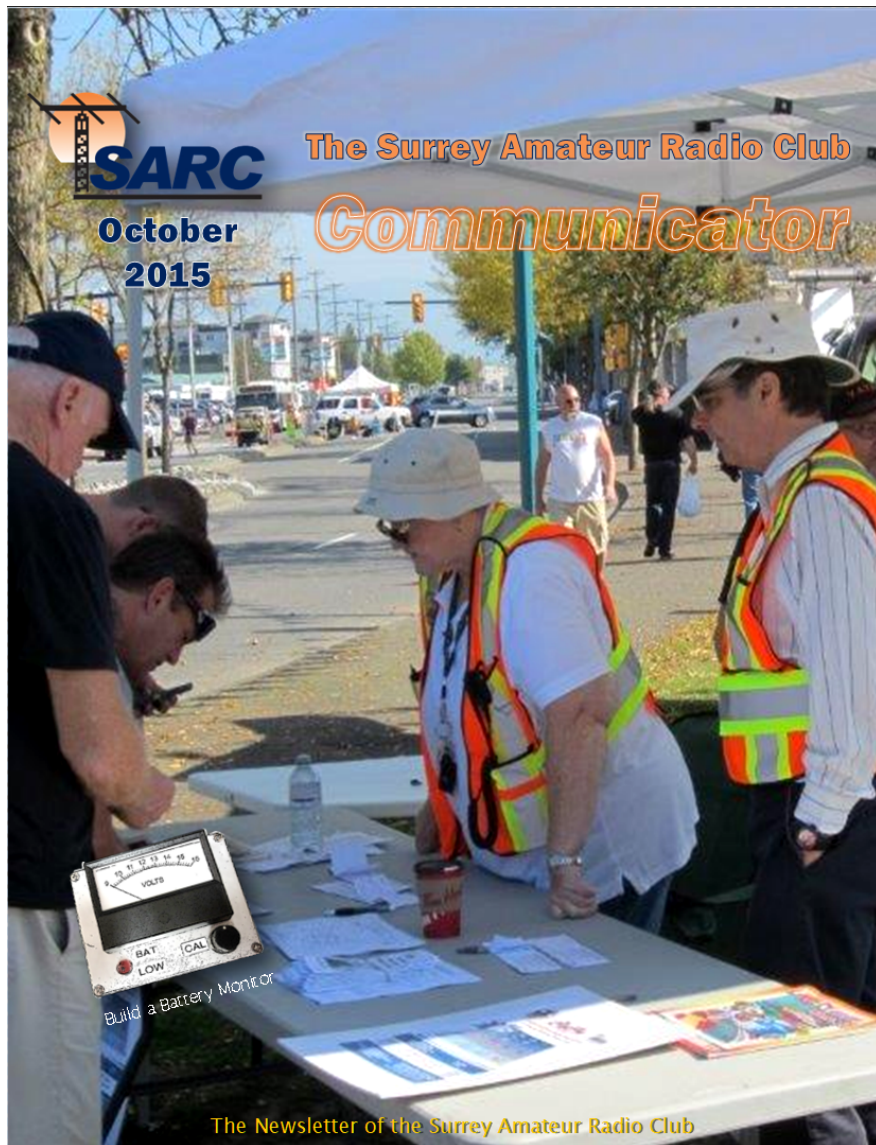
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A look back...

at The Communicator—October 2015



Read about it at:

https://archive.org/details/SARC_Communicator_2015-10/mode/2up

Past Communicators are available at:

[Past Communicator Issues](#)

or search the complete Communicator contents & index at:

[SARCindex](#)



September-October

We resume our in-person monthly meetings in September and October. For September 10 we have invited Dave Cameron VE7LTD, the developer of IRLP, who now works for E-Comm, our local 9-1-1 call centre and emergency services radio network. One of Dave's primary tasks is localizing sources of radio interference and he will be explaining some of his more unusual finds.

October 7 is our 50th anniversary and, at our October 8 meeting, we are planning something to commemorate the event. Stand-by for further details.

To put the date in perspective, among the notable occurrences in October 1975 was the 'Thrilla in Manila': Muhammad Ali stopped Joe Frazier in 14 rounds in Quezon City. Sectarian violence raged across Northern Ireland, the USSR was conducting nuclear testing near Alaska, Israel signed a peace deal with Egypt, Saturday Night Live aired its first episode, Gerald Ford was President of the US and was broadsided in his limo, the US Space Shuttle program was testing engines to use in future flights, the Soviet orbiter Venera 9 becomes the 1st spacecraft to orbit and land on Venus, the US Supreme Court ruled teachers could spank their pupils after a warning, Juan Carlos became King of Spain following the death of 40-year dictator Francisco Franco, and the US Coast Guard Academy first allows women to enroll.

On the Web ve7sar.net

Between Communicators, watch your e-mail for news, announcements of Amateur Radio events, monthly meetings and training opportunities.

Click the links below to follow our presence on the web and social media:

SARC Blog
ve7sar.blogspot.ca

Bluesky (No more 'X')
[#ve7sar.bsky.social](https://bsky.app/profile/ve7sar)

FaceBook
[SurreyAmateurRadio](https://www.facebook.com/SurreyAmateurRadio)

Our YouTube Channel
[SurreyARC](https://www.youtube.com/SurreyARC)

SARC hosts an Amateur Radio net each Tuesday evening at 8 PM. Please tune in to the VE7RSC repeater at 147.360 MHz (+600 KHz) Tone=110.9, also accessible on IRLP node 1736 and Echolink node 496228. On UHF we operate a repeater on 443.775MHz (+5Mhz) Tone=110.9 or IRLP Node 1737.

Every Thursday evening at 8 pm is SARC's net for newly certified hams, although more experienced hams are also encouraged to attend. This net operates on the same frequencies shown above for the Tuesday nets. Participants will help you with your new-ham questions and assist you in getting comfortable using your radio. Check in with your GOTA net hosts.

Join the 220 MHz net taking place at 7:30 pm on the last Sunday of every month on VE7RSC repeater 223.960 MHz -1.6MHz tone 110.9 Hz, with net control, Shawn VE7BD.

This is not a "chat" net – just check in, exchange signal reports, and get on with your evening.

Down The Log...

SARC Monthly Meetings

2nd Wed. (Sept-Jun)
1900 hrs at the [Surrey Fire Service Training Centre](#), 14923 - 64 Avenue, Surrey, BC. Here is a [what3words](#) link and map: <https://what3words.com/markers.addiction.ozone>

Weekly SARC Social

Saturday between 0730 and 0930 hrs at the Denny's Restaurant, 6850 King George Blvd., Surrey BC

Workshops

Saturday between 1000 and Noon at the OTC 5756 142 Street, Surrey

SEPAR Net

Tuesday at 1930 hrs local on 147.360 MHz (+) Tone=110.9

SARC Net

Tuesday at 2000 hrs local on 147.360 MHz (+) Tone=110.9

VE7RSC Repeaters

2m North: 147.360MHz+
Tone=110.9Hz
IRLP node 1736
Echolink node 496228

2m South: 147.360MHz+
Tone=103.5Hz Fusion capable;
No IRLP/EchoLink

1.2m: 223.960 Mhz -1.6
Tone=110.9Hz

70cm: 443.775MHz+
Tone= 110.9Hz
IRLP node 1737
WiRES-X Room ID 00047

The Canadian Amateur (TCA),

Canada's premiere national magazine devoted to Amateur Radio, is published six times per year and is the membership journal of the Radio Amateurs of Canada (RAC). It is available in both print and digital versions (eTCA). Members of RAC, Canada's sole national Amateur Radio organization, receive TCA automatically.

A subscription to TCA also provides membership in Radio Amateurs of Canada. RAC is also the publisher of TCA. For information on how to join Radio Amateurs of Canada and subscribe to TCA please visit our [Membership Sign Up page](#).

At 64-pages per issue and reaching approximately 4,500 readers, TCA offers news and views on the Canadian Amateur Radio scene from coast to coast to coast. It includes regular columns, features and technical articles of interest to Amateur Radio operators. In addition, a Coming Events calendar, Feedback, QSL Bureau information and coverage of regulatory issues are also provided.

If you would like additional information about The Canadian Amateur magazine please contact the Editor Alan Griffin at tcamag@yahoo.ca.

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